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Editorial Notes

Air Raid Precautions

ON Thursday last in the House of Commons Sir John Anderson, the Lord Privy Seal, made an important announcement with regard to air raid precautions. He announced that the Government proposed in the immediate future to introduce a Bill placing some measure of obligation upon employers to provide for the protection of their workpeople against hostile attack from the air. He further indicated that these provisions would apply to industrial and commercial establishments employing over fifty persons, and would be under the supervision of the Factory Inspector, who would include the inspection of air raid precaution facilities among his duties under the Factories Act. So urgent does the Government consider this question to be that Sir John Anderson took the unusual course of indicating the nature of the provisions which would be contained in the Bill before its introduction into the House of Commons.

With regard to the protection of workpeople, the provisions of the Bill will fall under two main headings. First there will be the organization of air raid precaution services within the establishment, which includes the training of persons in first aid, fire fighting, and anti-gas measures. Secondly, there will be the provision of shelters, and the Government, through the Air Raid Precautions Department in consultation with organizations representing employers and workpeople, will issue a code giving guidance as to the various types of shelter appropriate to different kinds of industrial and commercial establishments.

On the financial side, Sir John Anderson pointed out that most of the work rendered necessary for the protection of workpeople would be regarded as a proper deduction from revenue in income-tax computations. He admitted, however, that some part of the work of affording protection might be regarded as of a capital nature, and therefore not admissible as a revenue deduction. He stated that the Government had been urged so to alter the ordinary laws of income-tax that capital expenditure incurred in connexion with air raid precautions could be treated as of an exceptional nature, and as such deducted in computing income-tax profits. Sir John gave various reasons why the Government had decided against this course. He pointed out that it would be inadvisable to upset the general laws of income-tax, that in certain cases it would be inequitable, and in any event the relief would come too late to be of real assistance.

The Government propose in the forthcoming Bill to provide for a payment from the Exchequer of a grant towards all reasonable capital expenditure incurred by employers in providing shelters for their workpeople, and the grant will be equal to the standard rate of income-tax upon the capital expended. The grant is, however, to be of a limited nature. It will be restricted to vulnerable areas, and to expenditure incurred within a specified time. The statement of Sir John Anderson can be taken as representing the maximum limit to which the Government are prepared to go in income-tax relief in respect of air raid precautions work.

The Government have made it clear that they consider that public utility undertakers must take upon themselves such work as they deem necessary for the maintenance of supply during hostilities. Although public utilities recognize that the Government are not able to bear more than one-half of the expenditure thus entailed, there will be a strong feeling that steps should be taken to ensure that work carried out in the national interest will not impose any additional burdens upon them as taxpayers.

Mains and Cables in Highways

THE Joint Select Committee of both Houses of Parliament which was appointed by the Government to consider the question of mains and cables in highways has completed the hearing of the cases presented to it on behalf of the Conjoint Conference and the Highway Authorities. The Joint Committee now have the unenviable task of reaching some decision upon complicated questions which have baffled all parties during a period of fourteen years' negotiations. The matter has no doubt been rendered more difficult by the fact that the London County Council and the Metropolitan Boroughs appeared separately, and disassociated themselves from the case presented on behalf of the other Highway Authorities of the country. They indicated that the traffic position in London was such that they could not agree to concede to public utility undertakers even the slender concessions which the other Highway Authorities had offered.

The Committee also decided to permit the mainline Railway Companies of the country to present their case before

them. This case dealt mainly with highways which were crossed by railway lines by means of either bridges or level crossings. The principal point which the Railway Companies endeavoured to establish was that, where the existence of sub-surface works in such bridges or level crossings would increase the cost of reconstructing such bridges or level crossings, such additional expenditure should be paid by the public utility undertaker. The matter is, of course, one for the Committee, but the public utilities may be forgiven for pointing out that they have never made such a claim upon a Railway Company in cases where the existence of a bridge or a level crossing has occasioned extra expenditure in connexion with the laying repair or removal of sub-surface works.

A further factor which we feel increased the difficulties of the Joint Committee was the fact that the Highway Authorities placed before the Committee new proposals which had never been submitted to the public utility undertakers. The most important point in these proposals, and indeed in the whole of the discussion, was the much discussed question as to the payment of expenditure involved in removing sub-surface works, where such a removal is rendered reasonably necessary owing to highway reconstruction. The suggestion put forward by the Highway Authorities was that where a main had been laid for thirty years or more the whole of such expenditure should be borne by the public utility undertaker. It was not contended that the life of a gas main was limited to thirty years, but this period was suggested on the somewhat flimsy excuse that it happened to be the period allowed by the Ministry of Health for the repayment of loans raised by local authorities in respect of gas mains.

The Conjoint Conference throughout the proceedings maintained a consistent position, and urged that the clause hammered out by the Committee which has been negotiating since 1934 should be ratified. The essence of this clause is that, where an impartial arbitrator finds that a reconstruction of the highway renders a removal of sub-surface works necessary, the expense shall be paid by the Highway Authority.

It was pointed out during the hearing that the reconstruction of highways was primarily for the benefit of the Highway Authority, representing in this case the super-surface user of the highway, and we feel that the Conjoint Conference is to be congratulated upon the consistent attitude in favour of this principle which it has maintained throughout.

Dangerously Swelling Coals

WHAT will be to most gas engineers a new subject was discussed on March 16 last at a Newcastle meeting of the Institute of Fuel and the Coke Oven Managers' Association when a Paper was read by Dr. G. E. Foxwell entitled "Dangerous Swelling Pressures in Carbonization Practice." It appears that certain coals, principally the lower volatile coking coals, can in the act of coke formation during some portion of the plastic stage develop internal pressures so high as to damage the brickwork of the retort or oven. Instances are known of whole batteries of coke ovens being ruined irretrievably, and having to be re-built, because a 100% dangerously swelling coal had been used for a day or two. Fortunately, damage from this cause in this country has been comparatively rare. Few British coking coals possess dangerous swelling properties. It may be, of course, that like the earlier diagnosis of cancer the comparative rarity of the disease may be because its clinical recognition has been faulty, but although certain undoubted instances have come to light of damage due to these dangerously swelling coals, the fact remains that we have nothing like the trouble in this country that has been experienced in Germany and the U.S.A., a fact which perhaps explains the little work which has been done on the subject here, and the fact that all the methods devised for examining the pressure-swelling properties of coals emanate from these two countries.

We doubt whether there is any evidence of damage from this cause to gas retorts. The horizontal retort has generally a space above the charge into which the coal can swell sufficiently to relieve the pressure. Since the plastic range of gas coals is passed through at the upper portion of the vertical retort when there is space to expand, much the same thing happens. Only in the intermittent vertical retort would the danger exist in any important degree, and here the conditions are possibly even worse from this angle than in the coke oven. It happens, however, that gas coals are in general higher in volatile matter, and thus more likely to shrink during carbonization, than the caking coals, and for this reason the coals used by the Gas Industry are less likely to possess dangerous swelling characteristics. Although we have no record of trouble in gas retorts from this reason, it may again be a case of faulty diagnosis, and the Gas Industry would do well to note the possibility of this cause of damage to retort walls.

The dangerous swelling pressure arises from the entrapping of gas within the plastic layer which always travels towards the centre of the retort or oven parallel to the heating walls. Its existence and extent depend upon the nature of the coal, just as does the plasticity of the coal. Experiment shows that the swelling pressure can be greatly increased by increasing the bulk density of the charge, and by increasing the rate of heating. Thus, coals which were quite safe under the older conditions of high moisture content, low flue temperatures, and wide ovens of moderate height, may become unsafe under the newer conditions of carbonizing dry coal in tall, somewhat narrower ovens heated to high temperatures. That has been the experience in other countries, and instances of it have been recognized here. The important consideration appears to be that a safe coal can be converted into a dangerous coal by the conditions of usage. It is thus very important that gas engineers and coke oven managers should not close their eyes to the danger but should investigate it thoroughly in order that the danger should be foreseeable in advance and adequate measures—described in the Paper—taken to guard against the possibility of serious damage. From the point of view of the carbonizing industries it is better that a coal should be classified as doubtful when it is safe than as the reverse.

Methods of Determination

THE methods in use for determining the swelling characteristics of coals are described in the Paper. They consist in heating a sample of the coal under known conditions and measuring the amount of expansion against a given pressure, or the amount of pressure required to prevent the coal from expanding. The methods in use in Europe are wholly of the empirical type, and in our view are not good enough. Instances are known in which they give misleading results, and have classified coals as safe that are dangerous, and *vice versa*. This is almost inevitable with empirical methods, though a communication from Dr. Mott, of Sheffield University, suggests that modifications to these methods may yet be found that will make them reliable. At the same time, it

would appear from other accounts that although the existing methods devised by Koppers and Nedelmann are not 100% accurate, the indications given are far from being as inaccurate as some would have us believe.

A chemist with experience of the apparatus has estimated that if a hundred coals taken at random are examined, in at least nine instances out of ten the apparatus give correct indications. That, however, in our view is not enough—the importance of the problem to the users and sellers of coal makes it evident that we must aim at 100% reliability. Moreover, it seems that we must get away from empirical methods and find small-scale means of testing which will enable results to be given that can be directly interpreted in terms of the pressures likely to be set in the carbonizing plant under specified conditions of bulk density and rate of heating. The valuable suggestion was made during the discussion that an apparatus capable of carbonizing substantial charges of coal heated under practical conditions should be set up, possibly at the Fuel Research Station, and that this apparatus should serve as a sort of national testing station for the examination of coals, either as part of the Fuel Survey, or at the request of individuals.

The communication which Mr. Spiers, of the Woodall-Duckham Companies, made to the meeting provides in our view convincing evidence that the matter should not be allowed to rest as a suggestion. He said: "In England there has always been a certain amount of scepticism as regards the possibility of the occurrence of coals too dangerous for treatment in carbonizing plant. . . . This scepticism existed even though certain owners of coke ovens knew quite well that some of their coals were unsafe for use individually." The further suggestion made by the Author of the Paper that the Fuel Research Board and the Building Research Station might undertake work on the stability of the walls of carbonizing chambers also appeals to us as likely to lead to useful results. Whether coals exert a dangerous swelling pressure or not, most coals exert some pressures on the walls of ovens and retorts, and these walls are said to be continually in motion due to these pressures. There is, so far as we know, only the one published attempt described in the Paper to determine the stability of walls, and an extension of this work embodying various types of bonding, before and after firing, would seem to have important possibilities for the carbonizing industries. The National Physical Laboratory has been called in to work on spiral-guided gasholders, and similar work on other sections of gas-making plant might follow.

Suppression of Swelling

At the meeting Mr. H. J. Hodsman, of Leeds University, made a most interesting contribution to the discussion on the Paper. He explained that recently he had observed that some ammonium salts—*e.g.*, ammonium sulphate—will completely suppress the caking or swelling of a highly swelling coal. Such a treatment obviously has the advantage of not increasing the ash content of the resulting coke. Under comparable conditions, a highly swelling Haigh Moor coal when heated to 450° C. expanded 50% without any added salt and 1% only when 2% of ammonium sulphate was admixed before carbonizing. It would appear that one can arrange to carbonize any swelling coal without producing any expansion at all. It may be urged that ammonium sulphate is too costly a reagent to use for this purpose; but Mr. Hodsman remarked that some years ago, in conjunction with Messrs. W. C. Holmes & Co., Ltd., he established the possibility of recovering gas-works ammonia as a crude sulphate of ammonia by washing the flue gases with crude gas liquor. The sulphur dioxide in the flue gases neutralized the ammonia and the resulting salt was oxidized to sulphate, the concentration of which rose to 40% owing to evaporation of water. This liquor has an effect on the swelling of coal commensurate with its salt content. Moreover, the ammonia is not consumed, but is recovered in the liquor resulting from the carbonization of the treated coal. These observations open out a wide field of investigation. How far can the swelling power be reduced without undue sacrifice of mechanical strength? What are the properties of the resultant coke? How far can this treatment be applied to carbonization at low temperatures in which swelling has proved a serious trouble? It may also have an application to producer gas practice.

South Yorkshire Gas Grid

Giving due weight to all the circumstances, one must agree with the Chairman, Lieut.-Col. Sir Henry K. Stephenson, when he says it is remarkable that, while the general trade of the country suffered during last year a severe setback, the Sheffield and District Gas Company not only maintained their position, but continued to increase—and to increase substantially—their sales of gas and of appliances. While extending to the rearmament programme some portion of the credit for this encouraging state of affairs, there is greater satisfaction to be found in his expression of opinion that it is due in even greater measure to the public's growing appreciation of the advantages which gas offers as an industrial and domestic fuel. This is a matter which is of vital importance to the Gas Industry as a whole, so that we are all under a debt of gratitude to those associated with this great undertaking whose enterprise and ability have done so much, and are doing so much, to foster this growing appreciation of the advantages of gas. Always, in great degree, the eyes of the world are on Sheffield, owing to the importance of its manufactures, the modernity of its methods, and the vastness of its industrial operations. These, of course, are attributes which offer opportunities to gas that are not to be found everywhere, but not without signal keenness and foresight on the part of the Board, coupled with ceaseless effort on the part of the General Manager, Mr. Ralph Halkett, and those working under him, would the achievements of the undertaking have reached anything approaching their present magnitude. Tributes paid to Mr. Halkett during the proceedings were particularly well deserved, for it is certainly true that the striking success of the Company is in very large measure due to his ability and untiring energy added to which he possesses, as the Chairman remarked, a unique knowledge of the Gas Industry.

Figures conveying some idea of the success that has attended the efforts of the Sheffield Gas Company are to be found in the Address of Lieut.-Col. Stephenson to the proprietors at the Annual Meeting, as recorded in last week's issue of the "Journal." The total quantity of gas sold during the year was over 10,717 million cu.ft.—an increase of nearly 8% over the sales of the previous twelve months; while it was stated by Mr. Halkett in the course of the proceedings that since 1932 the total sales of gas have increased by over 115%. With the increased sales last year, the income from gas was naturally more, but there was also an increase in the revenue from residual products, due to the Company having been obliged to manufacture a greater quantity of gas in consequence of the shortage of coke oven gas. Against

this, however, has to be set the extra expense of manufacturing gas as compared with the purchase of coke oven gas. As a matter of fact, the reductions during the past year in supplies of coke oven gas from several of the Coking Companies which are members of the South Yorkshire Gas Grid Company have not only caused the Sheffield Gas Company much concern, but have put them to very considerable expense by obliging them to manufacture gas at their own works to make good the deficiency. This is a condition of affairs in which sympathy will be felt with the Company, who, in the words of the Chairman, have at great expense popularized and distributed the gas much to the benefit of the coke oven owners, who, before the Company's intervention, were blowing it to waste in the air.

Facts and figures which the Chairman presented at the meeting illustrate clearly some of the advantages that the South Yorkshire Gas Grid has conferred upon the coking industry, while at the same time greatly benefiting the steel industry. The fourteen coke ovens from which gas is now taken are connected-up by some 100 miles of high-pressure mains ranging from 24 in. to 8 in. in diameter. The total length of mains supplying the area served by the Company is now nearly 1,300 miles, and as the result of recent amalgamations they are supplying gas from Barnsley in the north to the Matlocks in the south—a distance from north to south of approximately 45 miles. Altogether the Chairman's Address should do much to create a proper understanding of the great value of the Company's work, and to remove his feeling that the magnitude and success of the Company's pioneer effort in the construction and operation of the South Yorkshire Gas Grid have not been adequately appreciated by the general public.

Personal

Mr. W. E. WEBB, of the Gas Light and Coke Company, has been elected Vice-Chairman of the Hounslow and District Chamber of Commerce. He is a Councillor of the Borough of Heston and Isleworth.

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Mr. WILLIAM P. MITCHELL, Technical Assistant to the Johnstone Corporation Gas Department, has been appointed to a similar position with the Motherwell and Wishaw Gas Department.

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Many of our readers who are interested in Association football will be pleased to know that Mr. F. W. WORT, who is on the London Office staff of John Wright & Co., Ltd., has been selected by the Association to referee the Cup semi-final game between Grimsby Town and Wolverhampton Wanderers.

The match takes place on the Manchester United ground on Saturday. It may be recalled that Mr. Wort was a linesman at the Wembley Stadium Final last year.

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A luncheon was given by Mr. Chas. F. Botley, of Hastings, on March 14, at the Savoy Hotel, London, to the executive officers of the Companies forming the South-Eastern Gas Corporation, the occasion being a presentation to Mr. H. M. CLOSE, who recently retired from the position of Chief Stores Buyer for the Gas Light and Coke Company and the South-Eastern Gas Corporation. The toast to Mr. Close, proposed by Mr. C. Valon Bennett, of Rochester, was enthusiastically received. Immediately following, Mr. Botley, on behalf of the subscribers to the testimonial, presented Mr. Close with a gold half-hunter watch, suitably inscribed, together with a gold pencil case. Mr. Close responded, expressing his very real pleasure at the tribute paid to him, and of the delightful manner in which it had been done. Mr. H. A. Probin, General Manager and Secretary of the South-Eastern Gas Corporation, proposed a hearty vote of thanks to Mr. Botley, the Chairman and host, whose hospitality was appreciated by all. Mr. F. A. Gulland, of Maidstone, provided the music, and composed a topical song for the occasion.

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We are pleased to report the appointment of Mr. ALEX. O. RUSSELL as a Director of Messrs. Fletcher, Russell, & Co., Ltd. (Radiation Limited), of Warrington and London.

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The Amalgamated Denaby Collieries, Ltd., have appointed Dr. G. S. HASLAM, B.Sc. (Tech.), Ph.D., Assoc.M.I.Min.E., as Chief Chemist and Fuel Technologist. Dr. Haslam studied fuel technology at Sheffield University and has specialized in the treatment of coal and its preparation for the market. He has held an appointment under the Safety in Mines Research Board and has been associated with a number of processes connected with the production of oil from coal. He relinquishes a post on the technical staff of British Furnaces, Ltd., and takes up his new duties on April 3. The collieries, comprising the Denaby Group are Denaby, Cadeby, Dinnington, Maltby, and Rossington, all of which are situated in the South Yorkshire coalfield.

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HUBERT ARNOLD THORPE, third son of the late Mr. F. Thorpe, who was Engineer and Manager of the Colne Corporation Gas Department, and Mrs. Thorpe, and who is the Technical Assistant to the Ilkley U.D.C. Gas Department, was married at Ilkley Parish Church on March 4 to Eleanor, eldest daughter of Mr. and the late Mrs. Green, of Colne. A presentation in the form of a tea wagon was given by the staff and employees of the Department.

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Mr. J. E. YOUNG, Manager of the Grantham Gas Company, has been elected President of the Grantham Chamber of Trade, and on March 10 delivered his Presidential Address at the Chamber's Annual Meeting.

Obituary

The death has taken place at Burntisland of Mr. JAMES P. GILMOUR, Solicitor and Joint Town Clerk of that town, who for a great many years also held the office of Treasurer of the Burntisland Gas Company, which later was acquired by the Corporation.

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Hastings has lost one of its oldest business men by the death at his home on March 4 of Mr. A. M. APEL at the age of 74. In 1918 he was elected a Director of the Hastings and St. Leonards Gas Company, and was Chairman of the Company at the time it was taken over by the South-Eastern Gas Corporation. Mr. Apel remained as one of the three local Directors on the Board. In conjunction with Mr. C. F. Botley (Engineer and General Manager of the Company), Mr. Apel took a keen interest in promoting co-partnership among the employees, and at the wish of the Board became Chairman of the Co-partnership Committee, a position which he held up to the time of his death.

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Mr. BENJAMIN PEAT, Secretary of Messrs. Ashmore, Benson, Pease, & Co., Ltd., Gas and General Engineers, of Stockton-on-Tees, has died at Stockton, aged 50. Mr. Peat, who was a native of Workington, had been Secretary since 1921. He leaves a widow.

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The death occurred on March 18 of Mr. LESLIE JAMES BLACKBURN, who was for many years Engineer and Manager of the Hong Kong and China Gas Company until his retirement about nine years ago.

Amalgamation and Grouping

British Gas Light and Billingshurst.

Among the objects of a Special Order under the Gas Undertakings Acts, 1920 to 1934, for which the British Gas Light Company intend to apply to the Board of Trade, is the transfer to and vesting in the Company of the Gas Undertaking of the Horsham Rural District Council and to authorize the Company to supply gas in the parish of Billingshurst in the rural district of Horsham and the parish of Wisborough Green in the rural district of Petworth.

Proposed Lancashire Link-up for A.R.P.

The linking-up of gas supplies under an area scheme has been the subject of recent discussions between the Rochdale Gas Committee and representatives of the Gas Undertakings of Oldham, Heywood, Middleton, Rossendale, and Littleborough. It is thought that the cost of linking-up the Rochdale and Oldham supplies would be about £7,000. Assuming the Government contributed £3,500 towards this expenditure, Rochdale and Oldham would pay the other £3,500 between them. At the moment, however, nothing definite has been decided at the Rochdale end, and, in any case, a link-up with Oldham would form only a part of Rochdale's plans.

Letter to the Editor

Economics of Benzole Recovery

SIR,—During the past few weeks I have read with no little interest the various contributions to the "JOURNAL" on the subject of benzole extraction. I have purposely refrained from replying to the points raised in the hope that others might feel disposed to contribute their views on this very vital subject on which opinion is so much divided.

So far, however, no one has criticized my balance-sheet to any extent, nor has anyone produced a similar statement for or against extraction. That would be the only kind of criticism which could be considered constructive and effective.

I would like to thank your contributors because they have added to my interest in and knowledge of the subject as well as providing me with further arguments in my favour.

Mr. Firth, in particular, gave me some mental exercise trying to discover whence he conjures all his hypothetical figures. If the benzole was an equivalent gas consumer, he says, we would require an extra 520 tons of coal yielding an additional 234 tons of coke. That appears to be derived from 25,236 gallons × 1·6 therms per gallon and divided by 78·72 therms per ton which gives the amount of coal, from which the coke is derived at 9 cwt./ton, but without further explanation or criticism he changes my figures of coal and coke when the customer is for benzole and finds that the yield of coke is 14·8 against my 12·5 cwt. per ton (928 tons of coke from 1,474 tons of extra coal = 12·5 cwt./ton). However, I am glad that he brought out this point, because it shows that as a customer benzole is quite different from an equivalent gas consumer who would only add 9 cwt./ton of coke for the additional coal carbonized.

With regard to the novel argument that the water gas made *in situ* in the verticals is, in reality, being carburetted by benzole at 11d. per gallon, I can only imagine that this is an effort to "pull my leg," because I cannot believe that anyone would seriously argue that the benzole was worth 11d. per gallon until it was safely stored in tanks and delivered to the rectifiers. If it costs a shilling or more per gallon to put it there you are obviously in pocket by a penny or more per gallon by leaving well alone, not to mention the trouble you have given yourself and the other disadvantages which will become apparent as time goes on.

Mr. Firth takes exception to my additional cost of purification —to wit, £6 for the extra 1,474 tons of coal. He says, "0·06d. per gallon is equivalent to 1·2d. per 1,000 cu.ft. and is therefore obviously incorrect." This appears to be more "conjuring" to no effect. In actual fact the debit of £6 for additional purification was against 1,474 tons of coal yielding 17,237 cu.ft. of gas per ton, which is equivalent to 0·05d. per 1,000 cu.ft., the *sulphur being in the coal* and not in the benzole. I think you will agree that this is absurdly low for normal practice. In point of fact, however, 0·06d. per gallon is the figure given by Wickner and Richardson, of the Newcastle and Gateshead Gas Company, in a Paper to the I.G.E. (Transactions 1933-34), and is based on one year's actual working with a benzole plant at North Shields Gas-Works. The figure is so low that it cannot include overhead or maintenance charges on the purification plant. Incidentally, this same Undertaking's latest Annual Report includes these words: "This has been a poor year for export of coke, with the result that we shall have large stocks to carry forward at the end of the season. It has also been a bad market for tar products."

I wonder if it is fully realized how much these stocks actually cost an undertaking. Over and above the depreciation by weather and extra handling, &c., the bank loan interest charges may probably be raised by borrowing to the value of this stock at 4% per annum. For instance, a moderate stock, these days, of 50,000 tons valued at £1 per ton will add £2,000 per annum to the debit side, and I know of works carrying over 100,000 tons in stock, and, of course, smaller undertakings are affected proportionately!

In Mr. Firth's second letter he makes a very neat explanation of Mr. Waller's drop of 10 therms, showing how part has gone into benzole and part into water gas. Personally, I am not so greatly concerned where they have gone as about the fact that they *have* gone. In return he has a gross income (not profit) of only 1·116d. per therm, and in addition he, along with others, is helping to depreciate the by-product market to such an extent that the Industry as a whole is presently faced with no alternative but to increase the price of gas in order further to subsidize those markets which are being depressed instead of fostered.

The answer to Mr. Firth's statement that 7 of the 10 therms were derived from water gas is that that has been accepted already and allowed for, when (as he himself points out) the benzole customer yields 14·8 instead of 9 cwt. of coke per ton and both sides are agreed on a reduction in cost due to less steaming. As I pointed out in my orginal Paper, there is only one logical policy for the Industry, and that is to get these water gas therms back again by a wholesale conversion of the present high declared values down to much lower qualities.

I have been erroneously accused of boosting C.W.G. production in external plants. I plainly stated that that would raise the cost of production by about 5d. per 1,000 cu.ft. Water gas made *in situ* in the verticals is an entirely different proposition which can yield nothing but profit to the Industry.

The argument that a benzole plant will provide additional revenue to the steam raising plant by consuming the surplus steam is either absurd or a sad reflection on management.

I am also accused of overlooking the fact that a normal increase of gas sales means additional coke. Far from doing so, I have been trying to point out that even before benzole took so much prominence the supply of coke exceeded the demand and therefore caused instability of the market. In addition to the possible sudden increase of 25 to 30% in coke due to benzole we have some 4¼ million tons *increase* in coke oven product with which to contend. Moreover, if in Dunfermline we can sell 9 cwt. of coke to the ton with 430 gas, other undertakings should be able to sell considerably more coke with their higher calorific values. However, many of them *cannot*, and it is that fact which accounts for isolated undertakings buying coke to meet the demands made on them. These demands, by the way, are not created by any super sales policy, but are either because of the type of the local gas plant, some special local factors, or the low C.V. of the gas supplied. Increased gas sales on an average are relatively small and the additional coke thereby obtained comes within the power of the Gas Industry's marketing ability in most cases; if not, then I say again the obvious solution is to depreciate the calorific value.

Mr. Firth is quite correct when he points out that the increase in producer fuel and ashes should have been modified due to the reduction in steaming. I am not at all anxious to argue over £3, so I am prepared to cede that amount *in toto*, especially in view of the fact that my main purpose has been accomplished—namely, to draw attention to this minor "extra."

Mr. Robinson makes an excellent contribution which, unfortunately, just falls short of usefulness because he has omitted to give his balance-sheet, his stocks, and average price of coke and also his sales of coke per ton of coal with and without extraction. He rightly states that local circumstances are often determining factors, but in the original issue between Mr. Waller and myself the two undertakings are within 20 miles of each other and very similar in many ways. Mr. Robinson also draws attention to the inferior quality of benzole from continuous verticals, and it is, of course, this type of plant with which I am mainly concerned. Under the new price agreement a scale is to be introduced which will further decrease the revenue from benzole to those with verticals if the quality of their product is not up to the standard of 82% distillate at 120° C. I have a belief that that standard can be maintained with one gallon extraction, but extraction of any further amount will depreciate the quality. Mr. Robinson could, I am sure, enlighten me on that point.

"Gas and Coke Minded" quite rightly suspects my "pride" in my gas fire. There isn't a coke fire anywhere with which I would exchange it and our price of gas makes it possible for any of our consumers to have an 8 radiant fire at the cost of 1d. per hour. Moreover, the income to the Department is consequently 5·81d. per therm against the 1d. per therm derived from a coke fire.

I would like someone with vertical retorts to produce a representative balance-sheet showing a profit with benzole extraction taking the present market values of coke and tar, and not, of course, allowing for a decrease in the declared C.V.

"Gas and Coke Minded" also reproduces the old argument that this benzole consumer has an enhanced value because it can be cut off when peak loads occur, but seems to forget that that would disturb the characteristics of the normal gas supply besides further decreasing the revenue from the benzole.

Lastly, how much does "Gas and Coke Minded" imagine it would cost us to persuade each of our 13,000 gas consumers to burn 1 cwt. of coke per week when competing with coal at 27s. to 32s. per ton, not to mention gas at 5·81d. per therm? Furthermore, in Dunfermline we already have a developed market for coke, and will be one of the few undertakings approaching the new financial year with no coke stocks at all. The wholesale advent of benzole extraction will unfortunately depress our price of coke just as it will depress the price to those others whether extracting or not, and that is where the policy loses its local colour and becomes one of very definite concern to all undertakings.

Yours, &c.,
W. NICOL BAIRD.

Gas-Works,
Dunfermline,
March 17, 1939.

News of the Week

A.R.P. Workers at Newark, Notts., have arranged to hold a dance at the offices of the local Gas Company—where anti-gas and pro-gas supporters meet.

Gas is to Light the streets of the new Thistle Park housing scheme of the Denny and Dunipace Town Council. The Lighting Committee is to consider extending the area of street lighting in the Burgh.

Sanction to Borrow £20,665 from the Ministry of Health is being sought by the Middlesbrough Town Council for the purpose of the proposed new gas main from the Grangetown Works of Dorman Long & Co., to the Middlesbrough Gas-Works.

The Edinburgh Gas Department are among the exhibitors at the Scottish Building Exhibition, being held in the Waverley Market, Edinburgh, from March 15 to 25. Gas cookers, fires, radiators, and water heaters, as well as fires using smokeless solid fuel, are included in the Gas Department's exhibits.

Under the Auspices of the Dundee Corporation Gas Department, a display of gas appliances and gas cookery demonstrations was given in the Dundee showrooms from March 13 to 17. The cooking was carried out on the new "Major-General" gas-cooker from this year's B.I.F., Dundee being one of the first places at which this cooker has been exhibited.

An Increase in the price of gas, from 4s. 2d. to 5s. per 1,000 cu.ft., is announced by the Millport Town Council. The extra revenue is to be used to pay off in one year the sum of £1,200, of which £250 will be for gas mains and £950 for repairs to the large gasholder. An amendment to charge 5d. extra per 1,000 cu.ft. and spread the expenditure over two years was defeated.

Reorganizat'on of Staff is under consideration by the Bury Gas Committee. The object is to bring the manufacturing and distribution sections of the Undertaking under single control. The Committee recommend that Mr. W. H. Battersby be appointed Engineer and General Manager of the Undertaking for a provisional period of twelve months and that a distribution superintendent be appointed.

Opening a Gas Exhibition at Burnley, Mr. A. F. Ames (Engineer and Manager) stated that the increased costs of coal and materials would mean about 2d. a week extra on the price of gas to individual consumers. The service would be maintained if not extended to ensure the satisfaction of everyone. He advised consumers to use modern appliances, for by so doing they would probably more than make up for the extra charge by getting more satisfactory results and burning less gas

The Sale of the Gas-Works was referred to at a recent meeting of the Marple U.D.C. Councillor J. Smith said every member of the Council had a right to have every detail of the negotiations placed before him, before the Council gave its judgment on the matter. Councillor J. Cook (Chairman of the Gas and Electricity Committee) replied that there was not the slightest danger of the Committee doing anything without the Council having the fullest knowledge of what was transpiring.

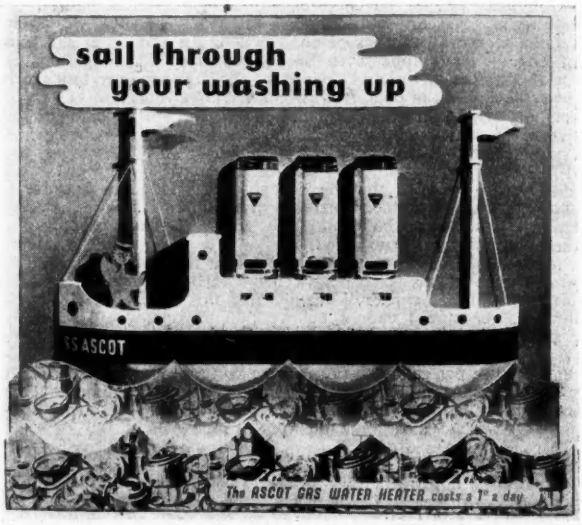
A Special Issue of the "Journal" of the Institute of Fuel has been published, containing the sixteen Papers which were contributed to the Symposium on Gas Temperature Measurement, which was held in December last, together with the verbatim report of the discussion following the presentation of those Papers. This issue is devoted entirely to that Symposium and is not one of the normal issues of the "Journal." It has, however, been agreed by the Council of the Institute that copies of it may be obtained by the general public from the Secretary, 53, Victoria Street, London, S.W. 1, at a price of 7s. 6d. post free.

Plans Have Been Approved for the modernization of the Airdrie Town Council's Gas Undertaking at a total cost of £21,000. The contract for the entire installation has been entrusted to Messrs. West's Gas Improvement Company, Manchester. Eight Glover-West retorts capable of producing 750,000 cu.ft. of gas per day are to be installed. The coal will be deposited from the works siding on to a lip-bucket conveyor and taken to overhead bunkers which will hold 48 hours' supply. The two producers will be fed by means of the same conveyor. At the same time it can deliver coke to outside coke storage hoppers for the purpose of filling railway waggons or carts. A waste-heat boiler will be incorporated in the new plant.

New Offices and Showrooms for the North Cheshire Gas Company at Dukinfield are nearing completion. They will be a handsome addition to the business premises of the town.

The G.P.O. has been trying to discover where the person who addressed a letter: "The Rushton and Iron Ferrous Gas Company, Gas Showrooms, Rushton," wished his letter to go. The letter was eventually correctly delivered to the Rushden and Higham Ferrers District Gas Company, Rushden, Northants.

Following a Report to the North-East Kent Area Guardians Committee that the expenditure of £30 for the provision of gas fires in the bedrooms of the Toddlers' Block at Manston Children's Homes had been approved, the Sub-Committee of the Homes pointed out that the fires would be installed for considerably less than that sum.



This Ascot display has been designed by Mr. Misha Black for the Gas Light and Coke Company. Mr. Black, who is retained as Display Consultant by the Gas Light and Coke Company, has been commissioned to design the Social Services and Maritime Sections of the British Government Pavilion at the World's Fair, New York, and is leaving for the United States at the beginning of next month.

Special Order Applications

Drafts of the following two Special Orders, application for which was made to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934, have been laid before both Houses of Parliament for approval by Resolution:

Bath.—With the object *inter alia* of transferring to the Bath Gas Company the Gas Undertaking of the Calne Corporation.

Bridport.—The objects relate to such matters as limits of supply, capital, and basic price.

Coke Oven Managers' Year Book*

1939 Edition

The circulation of the Coke Oven Managers' Year Book continues to expand yearly, and the increased number of copies of the 1939 edition which had to be printed bears evidence of the value this publication has for all who are concerned with the carbonization of coal. The greater part of the volume is devoted to the transactions of the Association; full reports, with photographs and diagrams, being given of the various Papers read before the different sections. The detailed table giving the latest information with regard to type of ovens, &c., is again a feature of the 1939 edition. Altogether this is a very useful book, summarizing in a comprehensive manner another year's activities of our sister industry. Users of the book should find it not one whit less valuable than its predecessors.

* Published for private circulation by Benn Bros., Ltd., Bouverie House, E.C. 4.

Saltcoats Celebrates Its Centenary

To mark the centenary of Saltcoats Gas Company, Ltd., a Scottish Conference of the British Commercial Gas Association was held in the Lesser Town Hall there on March 15, when appropriate reference was made to the history of the undertaking.

It was in 1835 that the success of gas light companies elsewhere induced the inhabitants of Saltcoats to attend a public meeting with a view to arranging for the introduction of gas to the town. It was stated at the meeting that the establishment of a gas light company "would be alike useful to the public and productive of a handsome remuneration to the Company!" A Committee was formed and charged with the duty of obtaining all possible information on the subject, and, as a result, it was decided to invite the public to subscribe to the funds of a Company. Capital was fixed at £2,000, divided into 400 shares of £5 each and 123 persons immediately took these up. The first Chairman was a Mr. John Banks, who was a saddler, and a Mr. Cook, then Manager of the Paisley Gas-Works, prepared plans for the Saltcoats Works, gas being first supplied to the town in December, 1836, at the price of 10s. 6d. per 1,000 cu.ft. A number of consumers paid a flat rate per quarter according to the number of jets they used and the hours they were kept alight, "watchers" being appointed to go round the town and see that these jets were extinguished at the time fixed. Numerous grievances arose out of this surveillance and the system was abolished in 1849, when the meter method was substituted. In the same year a new gasholder was erected, others being built in 1874 and 1888. In 1899 the property and assets of the Company were sold to a new concern, registered as the Saltcoats Gas Company, Ltd., with a capital of £16,000 in £1 shares, £12,000 of this being used to purchase the assets of the old Company.

In 1837 the output was 500,000 cu.ft. It rose steadily till last year the figure was 85,750,000 cu.ft., when the number of consumers had risen to 3,373. There are approximately nine miles of main pipes and all street lighting is by gas. For many years the cost of street lighting was met by public subscription. In 1859 an extra charge of 2d. per 1,000 cu.ft. was imposed on all consumers to defray this expense, this continuing till 1864 when the Company undertook to supply and maintain street lamps free of cost. In 1888 this practice ceased, street lamps in that year coming under the charge of the Police Commissioners, now the Town Council. The price of gas is now 4s. 2d. per 1,000 cu.ft., and last year the Company's capital was increased from £16,000 to £48,000 by the issue of one bonus share of £1 fully paid and one share of £1 at par for each share held. The present Chairman is Mr. John M. Orr and the Directors are Messrs. James Campbell, who is also Joint Secretary, Mr. D. R. Bryden, Mr. Thomas Scott, and Mr. Archibald Kay Young. From time to time various improvements have been effected in the plant, vertical retorts being installed in 1931.

The Company claims to be unique in having had as its Manager from 1846 to 1848 a woman of the name of a Mrs. Shearer. The present Engineer and Manager, Mr. James Barbour, was appointed in 1917.

The B.C.G.A. Conference.

At the District Conference of the British Commercial Gas Association held at Saltcoats on March 15 Mr. John M. Orr, Chairman of the Company, presided, and a civic welcome was extended to those present by Provost Harry Gaul. Thereafter Councillor E. Rosslyn Mitchell (Glasgow) gave an address on "A Survey of Thirty Years in the Gas Industry."

Councillor Rosslyn Mitchell said that when he entered Glasgow Town Council thirty years ago even the Gas Committee thought the days of gas were numbered. So great was the advance of electricity that the Committee thought it was not worth while substituting vertical retorts for the horizontal ones.

Mr. David Fulton, Engineer and Manager, Helensburgh Gas Department, Chairman of the B.C.G.A in Scotland, proposed a vote of thanks to the speaker.

At a luncheon held subsequently in the Eglinton Arms Hotel, the toast of "The Saltcoats Gas Company, Ltd.," was proposed by Councillor Rosslyn Mitchell, who said that the Company was one of the few private undertakings left in Scotland. One of their present Directors was Mr. James Campbell, great-grandson of the man in whose premises was held the meeting in 1835, which resulted in the formation of the Company. Their position compared favourably with those undertakings which worked under the restrictions of statutory authority, and he hoped they would continue to earn the approbation of the citizens.

Replying, Mr. John M. Orr sketched the condition of Saltcoats a hundred years ago, when weaving, tanning, saltmaking, shipbuilding, and seafaring pursuits were the main occupations of the inhabitants. The Gas Industry was the oldest extant business in Saltcoats. Their town faced the Atlantic and was sometimes subject to flooding. They knew what it was to have a breakdown in electricity, and therefore gas was an essential commodity. Other speakers were Bailie Peter Short (Troon); Mr. Thomas Scott, a Director of the Saltcoats Company; and Bailie James Adams (Saltcoats).

Institution of Gas Engineers

Members of The Institution of Gas Engineers will be welcome at a Joint Informal Meeting of the Institution of Mechanical Engineers with the Institution of Civil Engineers and the Institution of Electrical Engineers to be held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W. 1, on Friday, March 24, 1939, at 6.30 p.m. A Paper will be introduced by Mr. T. G. Rose, M.I.Mech.E., on "The Importance of a Training in Management for Engineers."

Members will also be welcome at an Extra General Meeting of the Institution of Mechanical Engineers to be held at the Institution of Mechanical Engineers on Friday, March 31, at 6 p.m., at which the Second Report of the Pipe Flanges Research Committee will be presented by Mr. H. J Tapsell, A.M.I.Mech.E.

Discussion on "The Properties and Testing of Heat Insulating Materials."

The Joint Committee on Materials and Their Testing in conjunction with The Institution of Gas Engineers, are organizing a Discussion on "The Properties and Testing of Heat Insulating Materials," which will be held on Nov. 23 next in London, in connexion with the Autumn Research Meeting of The Institution of Gas Engineers. The Discussion will be divided into three sections, namely: (1) High-temperature insulating material; (2) Low-temperature insulating material; and (3) Insulation of buildings and other applications. It is intended that the Papers shall review the present position of research and current opinion, not only in Great Britain, but also on the Continent and in the United States of America.

Copies of the following recently issued British Standards may be obtained, price 2s. each, from the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1:

No. 829-1939 Mild Steel Drums for Inflammable Liquids.
No. 830-1939 Winchester Bottles.

Forthcoming Engagements

March

24.—**Manchester District Association.**—Annual Meeting, Midland Hotel, Manchester.
24.—**Southern Association.**—Annual General Meeting, Hotel Victoria, W.C. 2, 2.30 p.m. Presidential Address of F. Blackburn.
25.—**Scottish (Western) Juniors.**—Annual Business Meeting, Christian Institute, Bothwell Street, Glasgow. Address by W. McL. Dick.
28.—**S.B.G.I.**—Council Meeting, 2.30 p.m.
29.—**Southern Association (Eastern District).**—Meeting at Gas Industry House, 2.30 p.m. Discussion on "Fuel Economy in Gas-Works."
30.—**Midland Juniors.**—Paper by H. G. Broadbridge, "Recent Developments in Control of Continuous Vertical Retorts."
31.—**I.G.E.**—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.

April.

3.—**I.C.C.A.**—Technical Committee, 2.30 p.m.
3.—**I.G.E.**—Joint Lighting Committee, 2.30 p.m.
4.—**I.G.E.**—Ad Hoc Joint Committee on Research, 11 a.m.
5.—**Manchester and District Juniors.**—Visit to Corby Works of Messrs. Stewarts & Lloyds, Ltd.
5.—**Yorkshire Juniors.**—Visit to Corby Works of Messrs. Stewarts & Lloyds, Ltd.
8.—**Scottish Juniors (Eastern).**—Visit to Pumpherston Refinery of Scottish Oils, Ltd.
14.—**North British Association.**—Spring Meeting at Leven.
15.—**London and Southern Juniors.**—Visit to Nine Elms Gas-Works.
15.—**Wales and Monmouthshire Juniors.**—Visit to Nine Elms Gas-Works.
22.—**Western Juniors.**—Annual General Meeting at Bristol.
26.—**I.G.E.**—Domestic Heating Committee, 2.30 p.m.
26.—**Southern Association (Eastern District).**—Meeting at Gas Industry House, 2.30 p.m. Discussion on "Breeze Production and Disposal."
29.—**Midland Juniors.**—Visit to Coventry Works of Geo. Wilson Gas Meters, Ltd., and to Foleshill Gas-Works.

May.

6.—**Manchester and District Juniors.**—Visit to Higginshaw Gas-Works, Oldham. Paper by F. Cartledge on "Coal and Coke Handling Plant at Higginshaw."
9.—**London and Scottish Juniors.**—Annual Business Meeting.
11.—**Midland Juniors.**—Annual General Meeting. Address by G. Dixon (Nottingham).
13.—**Scottish Eastern Juniors.**—Annual General Meeting at Edinburgh. Presidential Address of R. Cowie, Jnr. (Hawick).

National Gas Council

Meeting of Central Executive Board

A meeting of the Central Executive Board of the National Gas Council was held at Gas Industry House, 1, Grosvenor Place, S.W. 1, on March 14—Sir DAVID MILNE-WATSON, Bt., LL.D., D.L., in the Chair.

Retirement of Mr. J. E. Blundell.—A letter was read from Mr. J. E. Blundell, dated March 7, notifying the Council of his retirement from the position of Engineer and Manager to the Carlisle Corporation Gas Department at the end of the month, and of his consequent desire to sever his connexion with the National Gas Council. The Chairman expressed his appreciation of the services rendered by Mr. Blundell, especially as a member of the Rating and Valuation Committee. He had been a member of the Board since 1930.

It was stated that the Officers had already sent to Mr. Blundell a letter expressing appreciation of his services and thanking him for his loyal co-operation, and it was agreed that a record should be made in the Minutes of the services rendered by Mr. Blundell.

National Emergency.—It was reported that negotiations with the Government Departments concerned were proceeding satisfactorily.

A Report on "Organization of Road Transport for a Defence Emergency" issued by the Ministry of Transport for the benefit of holders of "A," "B," and "C" Licences under the Road and Rail Traffic Act, 1933, was circulated, from which it appeared that machinery was being devised to enable gas undertakings to constitute themselves into "groups" so as to ensure that in the event of war they should obtain the requisite fuel supply.

Coal Act, 1938.—(i) *Decision of North Staffordshire District Committee in the case of the Cannock District Gas Company, Ltd.*—It was noted with satisfaction that the Cannock District Gas Company had been successful in two complaints which they lodged with the North Staffordshire Committee of Investigation, both with regard to the question of delay in obtaining the requisite consent for the coals required, and also in connexion with the question of price.

(ii) *Durham District Committee of Investigation—Hearing before the Central Appeal Tribunal.*—It was stated that the Hearing was still in progress, so that no report could yet be made.

Mains and Cables in Highways.—It was reported that the Joint Committee of both Houses of Parliament which had been appointed by the Government to consider the question of modifying existing legislation relating to the breaking-up of streets for the purpose of laying pipes, &c., to meet modern conditions had sat on March 7, 8, and 9, and then adjourned until March 14.

The Hearing had been opened on behalf of the Conjoint Conference of Public Utility Associations by Mr. Jacques Abady, K.C., who had summarized the history of the negotiations between the Conjoint Conference and the Highway Associations which had taken place during the last fifteen years, and pointed out that on two occasions the Joint Negotiating Committee, consisting of representatives of Public Utilities and of the Highway Associations, had come to an agreement upon a suitable clause.

Mr. Abady stated that the Conjoint Conference stood by the clause in question, subject to certain amendments which had been subsequently agreed.

The Highway Authorities submitted that although the clause had been agreed by the Joint Negotiating Committee, it had never been agreed by the Highway Associations represented by that Committee, and they were not prepared to accept the clause put forward by the Conjoint Conference. On the contrary, they placed before the Committee new proposals which had never been submitted to or considered by Public Utility Undertakers.

A meeting of the Mains and Cables Committee of the Conjoint Conference had taken place the previous day, when it was decided to adhere to the contentions which the Conjoint Conference had consistently upheld, and in particular to the principle that the cost of the removal of mains, pipes, and cables due to a highway or bridge alteration should be borne by the Highway Authorities.

Railway Rates and Charges.—It was stated that a report had been circulated with regard to the present position, together with a copy of the letter which had been addressed by the Council to the Transport Advisory Council and also to the Ministry of Transport, showing that the Gas Industry would be particularly and peculiarly affected by any increase in the rates and charges for the carriage of coal and coke.

Rating.—It was stated that a report had been circulated regarding the proposal of the County Valuation Committee of Hertford immediately to reassess all Public Utility Undertakings throughout the County so as to bring the new assessment into force from April 1, 1939.

The whole matter of revaluation was being remitted to the Rating Committee of the Conjoint Conference, which would meet at an early date.

Ordnance Survey Maps.—Negotiations with the Ordnance Survey Office were reported, with a view to agreeing a scale of compounded royalties to cover the reproduction of Ordnance Survey Maps when made for the use of Gas Undertakings.

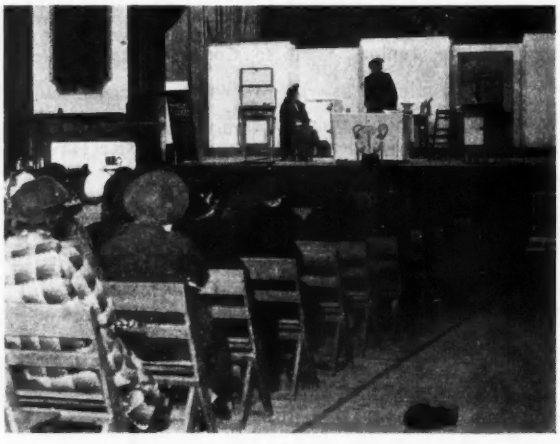
Annual Convention of the A.G.A.—It was agreed that a note with regard to the Annual Convention to be held in New York on Oct. 6-13, 1939, should be inserted in the Monthly Report of the Council for the information of members.

Date of Next Meeting.—It was agreed that the next meeting of the Board should be held on Tuesday, May 9, at the May Fair Hotel, at 12 (noon), prior to the Annual Meeting which would take place at Gas Industry House in the afternoon of that day.

Saltcoats Supports Cooker Fortnight

The Saltcoats Gas Company, in conjunction with Messrs. R. & A. Main, Ltd., organized an exhibition of gas appliances in the Beach Pavilion, Saltcoats, from March 13 to 17.

The opening ceremony was performed by Mr. John M. Orr (Chairman of the Company), who said that all the exhibits were absolutely up-to-date. They had Miss D. M. Gillman with them, who would give demonstrations of gas cookery twice daily. With such a large company of women present, it would be like preaching to the converted, but Miss Gillman would probably remind them of some sins of commission and omission.



Mrs. Eileen Murphy Speaking to Saltcoats Consumers We trust the black cat, though not apparently deeply interested in the address, brought Good Luck to the Cooker Campaign.

Mr. David Gibb, of Messrs. R. & A. Main, Ltd., said there was nothing experimental about any of the exhibits, and Mr. T. McEwan, also representing the firm, thanked Mr. J. Barbour (Engineer and Manager of the Saltcoats Gas Company) and his staff for their services in fitting up the exhibition.

Mrs. Eileen Murphy, Home Service Adviser to the B.C.G.A., visited the exhibition on March 15 and gave a special lecture to women. Three doctors out of four, she said, used gas fires because they knew they gave off healthy infra-red rays.

New Dunfermline Showrooms

Dunfermline Corporation Gas Department's new showrooms in Canmore Street were officially opened on March 20. The former showrooms, which are on the opposite side of the street, were opened in 1911, and have now been found inadequate and are now to be converted into workshops for the Department.

The new showroom has two storeys and is fronted with Northumberland stone. The ground floor has been laid out as a showroom and main office and is connected with the upper storey by means of a stairway and an elevator. A demonstration room on the second storey will hold 100 people.

The showrooms were visited by the Town Council and officials on March 20 in the afternoon, when there was a showing of Gas Industry films. In the evening there was a public opening ceremony. Miss M. Suddaby, of Radiation Ltd., is giving cookery demonstrations all the week at afternoon and evening sessions.

Jack the Ripper

An unusual title for a "GAS JOURNAL" article! It would, indeed, probably not have found its way into the "JOURNAL" at all had it not been the title of a book by William Stewart, well known to the Gas Industry as B.C.G.A. Production Officer.

William Stewart photographed in Whitechapel while getting material for his book.

Stewart retells the story of a problem which fascinated the older generation, and is still fascinating, since it has never been solved. He shows how none of the theories hitherto advanced will square with all the known facts. He advances an explanation, sensational but convincing, which we believe has never before been presented.

The Author has had a career of extraordinary variety and interest. He was apprenticed to the Merchant Service at the age of 14. Spent eleven years in windjammers. Made two passages round the Horn before he was 16. Was introduced by the late Capt. Williams, of the London Press Exchange, to Reg. J. Sykes in 1911. Mr. Sykes trained Stewart in advertising, to be first contact man between the B.C.G.A. and the L.P.E. In 1916 he went afloat again on service till 1919. Having taken up drawing while at sea, he became in 1919 chief London theatrical artist and designer for the Stoll Circuit, but meanwhile acted as free-lance advertising man. Painted and wrote "Clanland," a book for the London, Midland and Scottish Railway, in 1927. Obtained the place of honour on the line at the Royal Academy in 1924. Has since exhibited at many British and Continental exhibitions. Joined the B.C.G.A. in 1930, and is now Production Officer. Has lived in the East End collecting material for a one man show of East End life, where he gathered the facts of Jack the Ripper. The main purpose of the book is an attempt to reconstruct a phase of East End life in the late '80's.

* "Jack the Ripper," by William Stewart, Quality Press, Ltd. 223 pp. Illustrated. 8s. 6d. net.

Course for Teachers of Gas Fitting

The Board of Education Short Course for Teachers of Gas Fitting is being held this year at Nottingham from July 3 to 8. As for the last two years at Birmingham, the Course is again under the general direction of Dr. P. C. L. Thorne, H.M.I. While the general programme is somewhat similar to that of the two previous Courses, many of the lecturers will be new to the Course, and it is hoped to arrange for more time to be given to discussion and tutorial work than in former Courses.

No fee is charged to Teachers, or intending Teachers, accepted for the Course. Under certain conditions grants towards travelling expenses will be made. Accommodation for those coming from a distance is being provided at one of the hostels of University College, Nottingham.

It is hoped that undertakings will encourage Teachers of Gas Fitting in their employment to attend this Course. As accommodation is limited early application is advisable. Further details and forms of application may be had from Local Education Authorities or from the Secretary, Gas Education Committee, The Institution of Gas Engineers, 1, Grosvenor Place, S.W. 1.

Ewart & Son, Ltd.

The Directors of Messrs. Ewart & Son, Ltd., in their report to be submitted to the shareholders at the thirty-eighth annual general meeting to be held on March 22, state that they are unable to recommend any further dividends for the year 1938. The accounts for the year, notwithstanding many reductions in expenses, show a loss of £5,646 7s. 2d., after taking credit for realized profit on sale of investments and a transfer from the reserve for taxation, &c., of an amount no longer required for income-tax. From this falls to be deducted the balance of £3,153 10s. 6d. brought forward from last year, leaving a net debit of £2,492 16s. 8d. This result is arrived at after making due allowance for depreciation of plant, machinery, and buildings.

During the first half of the year 1938, it was hoped that the profits would allow of dividends being paid for the year, and the six months' dividend on the preference shares due on June 30, 1938, was paid. Unfortunately, expectations did not materialize owing to the slump occasioned by the September crisis, resulting in stagnation in the building trade, and the decline in business generally. The sum of £5,840 12s. has therefore been transferred from dividend equalization reserve to cover this payment. The Company's factories and plant have been maintained in efficient condition and are available for an increased output when normal business conditions return.

Gibbons (Dudley), Ltd.

In their annual report for the year ended Dec. 31, 1938, the Directors of Messrs. Gibbons (Dudley), Ltd., state that the net profit for the year, after providing for income-tax, National Defence Contribution, and depreciation, is £26,481, which, added to the amount brought forward from last year, £12,100, makes a total of £38,581. From this amount the full 7% Preference Dividend, free of income-tax, for the year, was paid on June 30 and Dec. 31, 1938, absorbing £2,100, leaving a balance of £36,481 to be now dealt with. The Directors recommend that a dividend of 10% on the ordinary shares, less income-tax, be paid, £9,697, a bonus of 2½% on the ordinary shares, less income-tax, £2,424, further Directors' fees, £700, further to write off part of the cost of modernizing the works, £4,000, Dividend Equalization Fund, making a total of £7,500, £2,500, Reserve Fund, making a total of £40,000, £5,000, and to carry forward to next year £12,160, making a total of £36,481.

The Directors have appointed Mr. S. C. Metzgar, who has been connected with the London Office of the Company for many years, as an additional Director.

Saunders Valve Works Opened

A Model Factory

Alderman Arthur Jenkins, M.P. for Pontypool Division, declared open the new works of the Cwmbran Engineering Company, before a large gathering. The works are owned by a subsidiary manufacturing company of the Saunders Valve Company, and cover eight acres.

The opening ceremony was preceded by a reception and luncheon given by the Directors of the Saunders Valve Company, Ltd., and the opening ceremony took place in the afternoon, after which the visitors toured the works and grounds.

The factory, which cost £100,000, will employ, when in full production, some 150 hands. At present there are 116 engaged, and they are all local men, apart from the key men and a small percentage of boys.

Here will be produced the Saunders Valve, a patent which is in use in 58 countries of the world and in almost every kind of industry where the handling of compressed air and water, gases, chemicals, and all "difficult" fluids is necessary.

The Company, a subsidiary of the Saunders Valve Company, are specialists in making two different kinds of valves—the Saunders Diaphragm Valve and the Saunders Straightway Valve.

The manufacture will be on standardized lines—it will be a process of mass production—and the works have been so constructed that they will be able to deal with every possible call.

In addition to the works, there are at Cwmbran well-appointed offices, with all the latest aids to efficient and careful administration, and there is a laboratory, where not only tests are carried out, but constant research takes place. It is hoped in time that experiments will prove it possible to provide a rubber compound capable of withstanding extreme high temperatures, such as that of steam.

The moulds for the valves are made on moulding machines. The cores are made by machines and dried in hot-air ovens. The moulds are stored on roller tracks until there are a sufficient number to warrant pouring the metal.

All the smaller castings are handled in small trays 40 to 50 lb. in weight when loaded. They are machined on semi-automatic machines which do most of the operations on each casting at once.

They then pass to the finished part storage racks, and afterwards to the assembly and spray painting department.

Large valves are made by more or less individual operations.

In the rubber shop the rubber is mixed and masticated in a mill and made into sheets on a calender, which is also used for rubber-coating the cloth. The rubber sheet and fabric is cut out into shapes for the diaphragm moulds which can hold several diaphragms at once. The moulds are closed and put into steam-heated hydraulic presses which vulcanize the rubber, after which the necessary holes are punched to complete the diaphragm. The largest presses exert a pressure of 250 tons.

The tool room and pattern shop is of the most modern design and equipped with accurate machinery.

The welfare of the staff is not forgotten. There is a spacious canteen, a cardroom, and a fully-equipped first aid room. Facilities for sports are being planned.

Illuminating Engineering Society

Proposed New Status

Mr. Percy Good presided over a record attendance at the annual dinner of the Illuminating Engineering Society at the Trocadero Restaurant on March 14. The Institution of Gas Engineers was represented by Sir Frederick J. West, and among other distinguished guests were Mr. C. Le Maistre, Director of the British Standards Institution, Sir Duncan Wilson, Chief Inspector of Factories, Dr. A. P. M. Fleming, President of the Institution of Electrical Engineers, Mr. J. R. Beard, President of the Association of Supervising Electrical Engineers, Mr. E. Shurly, President of the Master Sign Makers Association, and Miss C. Haslett, Director of the Electrical Association for Women.

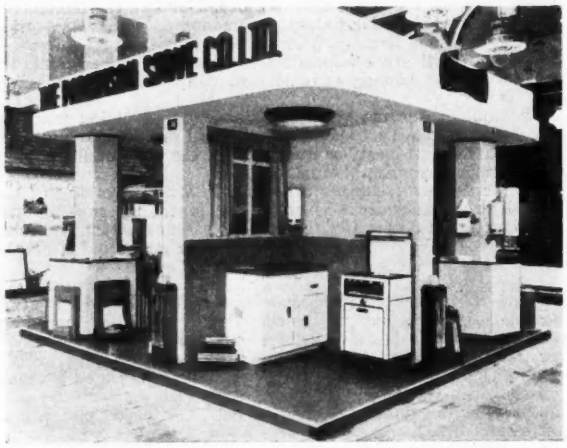
Following the loyal toast, Mr. H. Berry, Chairman of the Town Planning and Building Regulation Committee of the London County Council, proposed the toast of the Society, which, he said, was the inheritor of a long tradition, older even than the race itself. One of the most crucial events in the history of the universe was when the Great Architect uttered the words "Let there be light," for from the coming of that light all subsequent developments sprang. The London County Council was alive to the reaction of light on life with regard to the schools and in other directions, and he was glad to know that there had been co-operation between the Council and the Society. He hoped that the status of the illuminating engineer would be more clearly defined in the near future and that there would be a definite hall mark for him.

The President, responding, congratulated the London County Council on attaining its jubilee and mentioned that the Council had recently marked its appreciation of the Society's work by voting fifty guineas to its funds. The Council had also recognized the value of floodlighting and had brightened London's riverside, and he suggested that the Government might well follow the good example by lighting the stretch of river front from Lambeth Bridge to Westminster Bridge. Members of the Society had presented the Government with adequate apparatus for floodlighting its public buildings, and he urged that the riverside façade of the Houses of Parliament should be illuminated every evening.

The Society was celebrating its thirtieth birthday and its membership was nearing the thousand mark. From six meetings per year the number had grown to more than fifty, and the Society now had five local centres and five special sections. The question of providing some form of status for the trained illuminating engineer was now coming to a head. Already arrangements had been made by the City and Guilds of London Institute to provide examinations, and it was anticipated that before long the Council would submit proposals for the provision of a class of membership restricted to those who were fully qualified as illuminating engineers and who had had reasonable experience in that work. In conclusion, Mr. Good urged that the Dome of St. Paul's should be regularly floodlighted.

Mr. F. C. Smith, Senior Vice-President of the Society, proposed the toast of the guests, and referred to the important part played by The Institution of Gas Engineers and kindred organizations in placing artificial lighting on the map.

Mr. H. Robertson, Vice-President of the Royal Institute of British Architects, responded.



Our photograph shows a section of the attractive display arranged by the Parkinson Stove Company, Ltd., at the National Trades and Industrial Exhibition at Bingley Hall, Birmingham.

Athletic and Social

Herne Bay Children's Party.

Forty-three children of the staff and employees of the Herne Bay Gas Company attended a party given by the Company's Sports and Social Club on March 11.

Motherwell Annual Dance.

The staff of Motherwell Gas Department held their annual dance on March 10 in the Masonic Hall, when some 120 persons attended, the company including Mr. W. Kirk, Engineer and Manager.

Peterborough Social.

About 100 members of the Peterborough Gas Company's staff and employees, together with friends, enjoyed a happy evening at the annual supper and social, held at the Dujon Restaurant, on March 14. After supper there was dancing, whist, and games.

An Enjoyable Evening.

The Engineers' Club, Woodhouse Lane, Leeds, was the venue for a very interesting and enjoyable evening on March 1, when the staff of Clayton, Son & Co., Ltd., Engineers, Hunslet, Leeds, invited the members of the staff of Koppers Coke Oven Company, Ltd., Sheffield, to spend the evening with them, indulging in competition at various games.

The games were the culmination of a friendly challenge issued by Clayton's London representative, and billiards, snooker, darts, dominoes, and table tennis tournaments were arranged. Clayton's staff were successful in all events except table tennis. Apart from the attraction of the tournaments, the function proved very entertaining, and on departing for Sheffield the visitors expressed their delight and appreciation of their enjoyment. The results of the various matches were as follows: Billiards, Clayton's, 5—0; snooker, Clayton's, 3—1; darts, Clayton's, 7—3; dominoes, Clayton's, 6—4; and table tennis, Kopper's, 10—8.

Kilmarnock Employees' Reunion

The 54th annual reunion of employees of the Kilmarnock Corporation Gas Department was held on Feb. 24, Dean of Guild James Bryce, Convener of the Gas Committee, presiding over a company of 180.

Proposing the toast of "The Gas Undertaking," Councillor George Brown said he lived in an "all-gas" house. Electricity had been introduced to Kilmarnock in 1904, since when the annual output of gas had increased from 157 million cu.ft. in that year to an estimated total of 410 million cu.ft. for 1939. The Gas Committee had always kept the plant up-to-date and their results were second to none. The new plant installed in 1934 had already handled 110,000 tons of coal and produced 2,500 million cu.ft. of gas. Gas had been introduced to Kilmarnock in 1822 and the Corporation had bought the Undertaking in 1872.

Replying, Dean of Guild Bryce said that for the last three years the Gas Undertaking had paid over £7,000 per annum in rates. They had reduced the loan debt in the last few years but had been forced to renew one of the old gasholders at a cost of £16,000. Mr. Robert Fife, Engineer and Manager, also spoke.

Rotherhithe Copartnership Institute Dinner.

"A most enjoyable affair" is the usual verdict, of those who are fortunate enough to attend it, on the annual dinner and concert of the Copartnership Institute of the Rotherhithe Station of the South Metropolitan Gas Company. But the fourteenth, which was held last Saturday evening at the "Father Redcap," Camberwell Green, was voted the "best ever," although we have no doubt that it is not beyond the capabilities of the roistering "Rotherhitheans" to better the best. The chair was taken by the Station Engineer, Mr. T. A. Canning.

Speeches were brief and much to the point. "The South Metropolitan Gas Company" was honoured on the call of Mr. A. H. Andrews, Chief Engineer and Works Manager, and the reply by Mr. E. Croft, Employee Director of the Company. Mr. F. G. Brewer, M.A., Secretary, proposed "The Borough and Trade of Bermondsey," to which His Worship the Mayor of Bermondsey, Councillor A. V. Kidd, J.P., replied. Mr. H. P. Hollis put "The Metrogas Amateur Sports Association," Mr. H. Putt responding. "The Guests" was submitted by Mr. T. McSweeney and Mr. V. Field, A.M.Inst.M. and Cy.E., and Mr. W. J. Dees replied. Finally, Mr. A. H. Saville, B.Sc., gave "The Chairman," Mr. Canning, who was accorded musical honours, replied. The speeches were interspersed with an excellent variety concert, which included two quite unexpected but much enjoyed impromptu items.

B.C.G.A. Eastern District Conference at Bedford

A well-attended Eastern District Conference of the B.C.G.A. was held at Bedford on March 15 and 16 under the Presidency of Colonel W. M. Carr (Chairman of the Bedford District Gas Company). There was a reception and dance at the Corn Exchange on the opening evening and at the following morning session a cordial welcome was extended to the members by the Mayor of Bedford, Councillor A. Braggins. Professor J. D. Bernal, F.R.S., M.A., gave an Address on "The Conservation of National Resources," and the discussion was opened by Mr. W. W. Townsend (Managing Director of the Colchester Gas Company).

The members were afterwards entertained at luncheon at the Swan Hotel by the Chairman and Directors of the Bedford Gas Company.

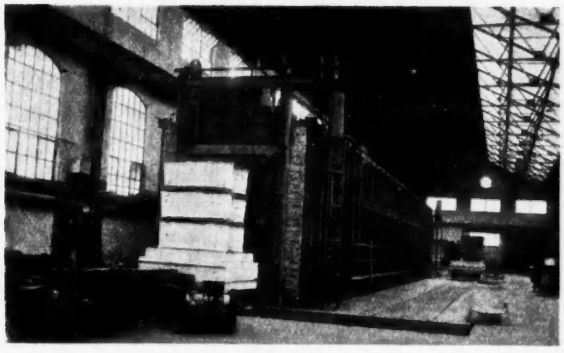
Proposing the toast of "Bedford—Town and Trade," Mr. J. H. RIOCH (Cambridge) mentioned that well over one-third of the gas made at Bedford was sold to industrial users. The Mayor, who responded, paid tribute to the Gas Company, particularly with regard to its willing co-operation in connexion with the breaking-up of roads.

Mr. H. GROSE-HODGE (Headmaster of Bedford School) proposed the toast of "The Gas Industry," and the CHAIRMAN (Colonel W. M. Carr) responded and proposed the toast of "The Guests." Mr. W. F. WAKEFIELD (Director of the Le Bas Tube Company), replying, said his Company recognized the benefit it derived from using gas; the question of whether they increased their consumption must depend upon the extent to which the Gas Industry recognized the service the Company offered to it.

In the afternoon visits were paid to the works of Messrs. W. H. Allen, Sons, & Co., Ltd. (engineering), Cryselco, Ltd. (electric lamp manufacturers), and Britannia Iron and Steel Works, Ltd., where the Le Bas Tube Company's GF malleable fittings are produced. The ladies visited the chocolate and confectionery works of Meltis, Ltd.

Manufacture of Malleable Fittings.

About 80 million cu.ft. of gas is used annually at the Britannia Works, of which the largest proportion is employed in the annealing furnace. When the pig iron, scrap, and other raw material has been melted in the cupolas it is transferred to pouring pots preheated by special gas units to maintain the necessary high temperatures. After moulding, the hot castings are separated from the sand moulds and the larger ones are placed in a gas-fired furnace to prevent too rapid cooling. The cores, prepared from selected sands, are baked in a gas-fired, thermostatically controlled core oven. Incidentally, the core department, as well as the moulding inspection department, is warmed by gas radiant heat units, which were adopted after extensive trials as the most suitable means of maintaining a comfortable working temperature.



A Gas-Fired Annealing Furnace at the Britannia Works, Bedford.

After cleaning, sorting, inspection, and weighing, the fittings castings are passed to the annealing department. In the foundry are also other gas units for plastic pattern melting, a non-ferrous melting furnace and heaters for maintaining the temperature of the pattern shop and stores. In the annealing department the castings, packed into pots together with fine iron ore and mounted on trolleys, pass through the annealing furnace, which has been in continuous operation since 1933. The use of gas ensures exact temperature control, and in the adjacent instrument room it is possible to check every detail of the progress of the castings throughout their fortnight's journey through the furnace. A gas blow-pipe operated by high-pressure air removes the scale from the pots. The fittings, which are now malleable, then go to the grinding machines and on to the power presses for straightening; here a gas-fired furnace with non-oxidizing flame heats the larger fittings before they are straightened.

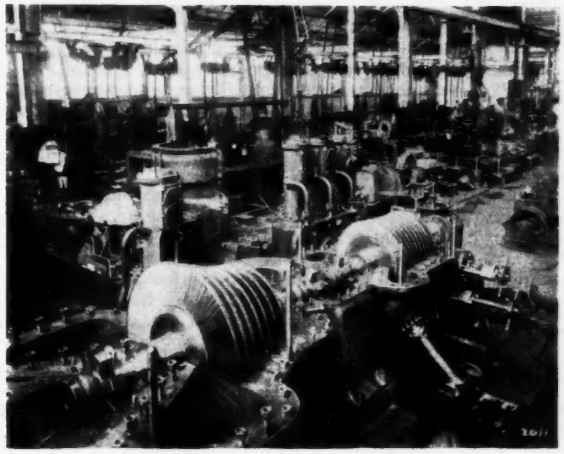
After this operation the fittings are again inspected and passed into tumbling barrels to bring them all to a black uniform appearance. The next operation is the forcing of a sizing mandrel into each fitting to obtain the correct core diameter. This is done by means of continuous eccentric presses, and the fittings are then weighed and put into unscrewed stock.

If galvanized fittings are required they are taken from the unscrewed stock and inspected, and after pickling are galvanized in a bath which is gas heated and regulated to maintain the spelter at the correct temperature. In the machine shop the fittings are threaded in machines which have been designed and evolved in the Company's associate works and represent the outcome of 70 years' experience. The stock rooms and machine shops are heated by means of air circulating units, the heat being supplied by two gas heated thermostatically controlled boilers. There is also a gas-fired tool hardening furnace in the mechanical workshops.

Gas was chosen for all these units, not because of cheapness, but because of its flexibility, ease of control, cleanliness, and saving of labour.

Production of Power and Pumping Plant.

Welcomed by Mr. W. K. G. Allen, one of the Directors, the visitors to the works of Messrs. W. H. Allen, Sons, & Co., Ltd., saw the production of independent and combined pumping units and complete power units and pumps for every branch of industry. The foundry buildings are equipped with the latest appliances for the production of large and small castings. Three high-temperature and two low-temperature stoves for mould drying are provided, and the brass foundry has five tilting furnaces of different sizes, two of them being of one ton capacity each. There are two machine shops, one for heavy and medium weight work and the other for light machine work, and a separate machine section is equipped for the production of gears necessary for various products, chiefly single and double helical reduction gears for steam turbines as well as large numbers of straight spur gear wheels, helical wheels for skew drives and oil pumps and worm wheels. One large section of the main fitting shop is devoted to the erection of oil engines and another is utilized for the building up of steam turbines, complete turbo-generators, condensing plants, steam engines, and other steam products.



A section of the steam turbine assembly in the Main Fitting Shop at the Bedford Queens Engineering Works of W. H. Allen, Sons, & Co., Ltd. In the foreground is a 6,000 B.H.P. turbine without top covers.

Pumps of all types are erected in a separate area of the main fitting shop and a special room is equipped with apparatus for testing the dynamic balance of rotating parts of high speed machines. Complete units are transported from the various sections of the fitting shop to the steam and pumping plant test shop. The laboratories comprise mechanical, physical, and chemical sections, in each of which continuous experimental and testing work provides valuable scientific service for present activities and future development.

The Midland Association of Gas Engineers and Managers

THE NEW PRESIDENT, G. C. Pearson, of Birmingham.

The Annual General Meeting of the Midland Association of Gas Engineers and Managers was held at the Grand Hotel, Birmingham, on Thursday, March 9, 1939—the retiring President (Mr. F. DAVIES, of Walsall), occupying the chair at the outset.

The minutes of the last meeting having been taken as read and confirmed, Mr. DAVIES extended a cordial welcome to the President of The Institution of Gas Engineers. The Midland Association, he said, were honoured by Mr. Robertson's presence at their meeting.

Mr. R. ROBERTSON, in reply, acknowledged the welcome they had so kindly given him. It was a great pleasure to him to be with them in his capacity of President for the time being of The Institution of Gas Engineers. The Institution was bound to reflect the views of the districts, and judging from the number of their members on the Council nothing was left in doubt as to the views of the Midlands. The fact that so many of their representatives had been co-opted to serve on various Committees indicated that the Council recognized the value and ability of the members from the Midlands. He wished the Association all success in the future.

The HON. SECRETARY (Mr. J. H. Wainwright, of Halesowen) reported the receipt of various apologies for absence, including one from Wing-Commander E. J. Hodsoll, of the A.R.P. Department of the Home Office, who was prevented at the last moment from attending. In his stead there were present at the meeting Mr. McCullough, A.R.P. Officer for the Midlands Area, and Col. Woodhouse, Chief Engineering Adviser to the A.R.P. Department.

The Hon. Secretary also read letters from the Secretary of The Institution of Gas Engineers appealing for greater support of the activities of the National Smoke Abatement Society, which was doing such valuable work in the promotion of gas and coke, and also of the Illuminating Engineering Society, of which a local branch had been formed; members were urged to attend the meetings of this branch and put the case for gas as strongly as possible.

Reports.

On the proposition of Mr. C. M. D. BELTON (Shrewsbury), seconded by Mr. H. DAVIES (Chesterfield), the Annual Report and Accounts were unanimously adopted.

Mr. R. S. RAMSDEN (Leamington) reported on the activities of the Midland Commercial Gas Association. Their Annual Report, he said, had been adopted that morning, and as practically the whole of the members of the main Association were also members of the Commercial Section he did not propose to go into details. The Report referred to the anxiety which was felt by members in regard to the coal situation and also referred on the position of the coke market. In the latter connexion, said Mr. Ramsden, prices had been well maintained, which was a feather in the cap of the newly formed Midland Counties Coke Association. He appealed to all members to join this Association, which was doing very useful work. The Report also contained the usual information from the British Sulphate of Ammonia Federation, showing the trend of this market. The Section had had two extremely interesting discussions during the year—one on the subject of the Leicester black-out and the other on the provisions of the new Factories Act, opened by one of H.M. Inspectors of Factories.

Mr. W. G. S. CRANMER (Willenhall) reported, in the absence of Mr. F. C. Briggs, on the work of the Midland District Education Committee. The Committee, he said, had an excellent Chairman and a most capable Secretary, and between the two of them and the "powers that be" in London the work had gone forward very smoothly, and there had been no need to call the members of the Committee together.

Thereafter Mr. G. C. Pearson was unanimously elected to represent the Midland Association on the Council of The Institution of Gas Engineers.

The following were appointed to represent the Association on the Midland District Education Committee:

F. Davies (Walsall).
C. F. W. Rendle (Redditch).
F. C. Briggs (Dudley).
W. G. S. Cranmer (Willenhall).

New Members.

The following were elected to membership of the Association:

R. Beech (Kidsgrove).
O. S. Brettle (Sedgley).
T. Watson (Rushden).
T. H. Woodcock (Stroud).

The PRESIDENT extended a hearty welcome to these new members and expressed the hope that they would find value and interest in their membership. Mr. Davies also made an appeal to members for greater support of the Institution Benevolent Fund. At the conclusion of his year of office, went on Mr. Davies, it was now his pleasure to vacate the chair in favour of Mr. G. C. Pearson whom they had elected to succeed him. Mr. Pearson had stepped into the breach at a time when they were in some difficulty in regard to the election of a President, and they were very much indebted to him. He then invested Mr. Pearson with the Presidential Collar and wished him a happy and profitable year.

Mr. G. C. PEARSON, on taking the chair, thanked the members very sincerely for the kind way in which they had received him. The honour should really have fallen on Mr. Rendle, but he had been unable to accept the office on account of pressure of business. He thought he would be expressing the views of all the members when he said he hoped Mr. Rendle's induction would not be long delayed. Mr. Pearson went on to extend a welcome to their visitors, including the representatives of the A.R.P. Department of the Home Office, Mr. G. Dixon, Vice-President of The Institution of Gas Engineers—who was also a member of their Association—Mr. A. L. Holton, of Manchester, Mr. W. E. le B. Diamond, Assistant Secretary of The Institution of Gas

Engineers, representatives of the Gas Light and Coke Company, and others.

The President assured the members he would do his best to uphold the traditions of his office, and his first duty was to propose a hearty vote of thanks to Mr. F. Davies for his services to the Association during the past year. Mr. Davies, he observed, came of a well-known gas family and had received his training under that distinguished Gas Engineer, Mr. Isaac Carr. When they had visited Walsall their opinion of Mr. Davies had been fully upheld by the orderly and well-managed works they had seen there. Mr. Davies was also bringing forward a number of well-trained Juniors to take over duties in the Gas Industry in the future. He had much pleasure in presenting to Mr. Davies the Past-President's Medal.

The vote of thanks to the retiring President was seconded by Mr. RAMSDEN, who observed that Mr. Davies had made a splendid job of his Presidency; he had followed in his brother's footsteps and had ably maintained the excellent standards his brother had set up.

Mr. F. DAVIES returned thanks for the Medal and for the kind remarks which had been made. If the members had enjoyed his year of office he felt that he and all those who had helped him had been amply repaid.

Presidential Address.

Mr. Pearson's Presidential Address, in which he discussed the application of Air Raid Precautions to the Gas Industry and gave a full account of the measures and training schemes adopted by the Birmingham Gas Department, had previously been circulated to the members and was taken as read. This and the general debate on the subject which followed was of a confidential nature and will not be published in the Technical Press.

A cordial vote of thanks to Mr. Pearson for his Presidential Address was proposed by Mr. G. DIXON (Nottingham) and seconded by Mr. P. N. LANGFORD (Coventry).

An Invitation to Birmingham.

The CHAIRMAN OF THE BIRMINGHAM GAS COMMITTEE (Councillor Giles) thanked the Association for inviting him to attend their meeting, and congratulated them on having elected his colleague, Mr. Pearson, to the important position of President. It was an action which gave both him and his Committee great satisfaction. He was particularly interested in Mr. Pearson's Presidential Address; he had brought before them a subject rather different from the usual technique of gas manufacture and one which was of great importance at the present time.

It gave him much pleasure to extend to the Association an invitation to visit Birmingham for their meeting on May 18, when Mr. Pearson would show them his works and other things of interest. The Gas Committee would be delighted if they would accept an invitation to lunch with them on that occasion.

The PRESIDENT thanked Councillor Giles very sincerely for his kind invitation; and the meeting closed with a hearty vote of thanks to Mr. Wainwright for his work as Hon. Secretary and Treasurer of the Association.

Alleged Maladministration at Southport

The hearing was resumed on Wednesday last at the Southport Police Court, of summonses against Mr. J. H. Clegg, the Southport Corporation Gas Engineer, and Mr. W. E. Plevin, the Deputy Engineer, alleging conspiracy at the gas-works in illegal practices in the administration of the Gas Undertaking. Reports of the hearing on Feb. 22 and March 3 were published in the "JOURNAL" for March 1 and 15. Last Wednesday's hearing concluded the evidence of the Chief Chemist, Mr. G. W. A. Illingworth, who, in all, was in the witness box for 18 hours.

On March 15 Illingworth was re-examined by Prosecuting Counsel, Mr. H. G. Shawcross, who handed to him the foremen's carbonizing book and asked him to look at an entry for Sept. 13-14, 1934.

Illingworth said there was a note stating: "Holder required for test 465 B.Th.U." This was not in Clegg's writing. He thought the writing was that of Marchant (another chemist).

Witness agreed there were three entries between Sept. 11 and 14 in regard to the special holder. These entries were made just before Clegg's written instructions that calorific value was to be recorded in the book. On both pages of one folio of the book there were entries in Clegg's writing, one relating to calorific value and the other to temperature.

Mr. Shawcross: Was that book examined by Clegg from time to time?—It was kept in the foremen's office and as far as I know Mr. Clegg would only see it in the foremen's office.

Would he see it in the foremen's office from time to time?—I am not absolutely sure of that.

Witness agreed with Mr. Shawcross that in the book in question and also in its immediate successor, covering the period from Oct. 26, 1924, to Dec. 1, 1934, there were frequent entries as to the alleged use of the special holder.

Mr. Shawcross: Was the average calorific value of the gas as shown in the calorific value book the same as the average calorific value shown by the Gas Examiner's reports?—No.

Were the figures of the works test lower or higher than the Gas Examiner's tests?—They were lower.

Witness added that from August, 1937, both the works tests and the Gas Examiner's tests were made on the same apparatus.

Mr. Shawcross: The only explanation of the fact that the Gas Examiner's tests consistently showed a higher average than the works test was that the Gas Examiner was being deceived?—That is so.

Illingworth, proceeding, said that if Clegg had noticed any difference between the works tests and the Gas Examiner's tests it would have been easy for him to ascertain it. By examining the books, the use of the special holder would become apparent.

Mr. Shawcross: Did Mr. Clegg, to your knowledge, ever make any enquiry why it was the Gas Examiner was getting high figures while the works was getting low figures?—No; not to my knowledge.

Mr. Shawcross: When you said that Mr. Clegg never ordered deception of any kind did you know of the figures Mr. Clegg was putting forward to the Gas Committee?—No.

Illingworth added that when he said that Clegg did not appear to be a party to a conspiracy he did not know of the information he might have received in regard to the question from other than himself.

Continuing, he said that in spite of a conversation he had with Clegg on Dec. 30 and an interview between Clegg and the chemists on Jan. 6, by Jan. 19 nothing, to them, appeared to have been done. It was for that reason that the chemists decided to go and see the Town Clerk.

That concluded Illingworth's re-examination by Mr. Shawcross.

Mr. Blackledge (for Plevin) obtained the permission of the Bench to put a further question in cross-examination to the witness regarding the purifying books. Witness, in answer to Mr. Blackledge, said that on two or three occasions he told the Deputy Engineer that Mr. Clegg wanted the books sent up to his office in Eastbank Street.

That concluded Illingworth's evidence. He had been in the witness box for a total of about eighteen hours.

Evidence of Mr. Grainger.

The prosecution's next witness was E. H. Grainger, a chemist at the Crowlands Works.

Mr. Shawcross: During the period prior to the appointment of Mr. Clegg, is it right to say that the gas regularly supplied to the town was not being maintained at the proper calorific value?—That is so.

Witness agreed on the previous points made as to the special holder and the practice of deceiving the Gas Examiner.

Mr. Shawcross: Was anything ever said to you personally by Mr. Clegg or Mr. Plevin as to the question of make per ton?—Mr. Plevin frequently mentioned that we must maintain the figures of make per ton that had been previously obtained.

Did he ever tell you how that could be done while keeping the calorific value up to 470?—No.

Witness, continuing, said that after Plevin's arrival at the Gas-Works the chemists felt that the purifying boxes were not being changed sufficiently often to keep the gas free of H_2S. He had many conversations with Plevin on the point, but could never obtain what he (witness) thought necessary.

Witness said that at about the end of July, 1937, a new Boys calorimeter was installed, and shortly afterwards this was used

by the Gas Examiner and the works staff for testing calorific value. Witness discovered, as a result of two accepted methods, that there was a discrepancy of 1% in the calorimeter.

He told Plevin of what he had discovered, and ultimately he was told by Plevin to set the meter by the method which gave a reading of 5 B.Th.U. high. Witness said that later he received explicit instructions from Plevin to find out what amount of water should be extracted from the meter to obtain a further advantage in calorific value of 5 B.Th.U.

Mr. Shawcross: Was it a proper thing to do, to extract water from the meter?—No. After the alteration of the meter, the records of calorific value shown in the official record books were approximately 10 to 12 B.Th.U. higher than the value of the gas actually being supplied to the town.

Mr. Shawcross: What was the object of altering the Boys calorimeter; because of the dissatisfaction of Mr. Plevin with the use of special gas?—He was not overpleased at the prospect of using a special holder, but found force of circumstances compelled its use.

Grainger, continuing, said they knew when to use the special holder because they were informed of the intended visits of the Gas Examiner usually, he alleged, by the Deputy Examiner. If he (witness) was the chemist on duty, he would turn on the special holder prepared for that purpose for supply to the town. The Examiner would make his test on gas from that holder. After he had departed the holder was shut off. More than once he (witness) had told Plevin of the expected visits of the Examiner, and on those occasions Plevin had said, witness alleged, "Prepare the holder for his coming."

Grainger said that on Dec. 14, 1937, they (presumably the chemists) had a note from Plevin complaining strongly of the calorific value supplied to the town. This was not consistent with the policy Plevin had previously instructed them to follow, witness alleged. The inconsistency was that it had been impossible to obtain 470 B.Th.U. with the air admission to the purifiers, which had been necessary to secure freedom from H_2S. The effect of the air admission had been to decrease the calorific value. He had pointed this out to Plevin many times, but Plevin had instructed them to continue the air admissions.

Witness said that from Dec. 30, 1937, till Jan. 10, 1938, sulphuretted hydrogen was present in the supply in alarming quantities. On Jan. 7 it showed 110 grains per 100 cu.ft. passing into the holders for supply. He made an entry to that effect in the purifying book.

Between Dec. 30 and Jan. 7 a small purifying box had been put off for changing. This would temporarily increase the difficulties. It was refilled and put back on Jan. 7, and would then temporarily alleviate the difficulty with regard to sulphuretted hydrogen. No steps had been taken with regard to the deficiency in calorific value.

Crisis at Hand.

They decided, said witness, to see Clegg because they knew there was a crisis at hand. "We realized before we could get out of the most difficult situation we were in we were going to have the town contaminated to an alarming degree, and it would be a matter not only for the Department, but possibly for outside action as well," said Grainger. "We felt we should have some understanding as to who would be responsible when that happened. We (Howard—another of the chemists—and I) went to see Mr. Clegg on Jan. 6. Another reason we decided to see Mr. Clegg was that we felt he might not have known the true situation about sulphuretted hydrogen passing into supply, not having the record book. I was convinced he had not had the record book."

About Jan. 4 he (witness) examined the purifier record book in Plevin's office and noticed that it had not been initialled by Clegg.

Witness said that Howard and he saw Clegg at his office on Jan. 6 and told him that large quantities of sulphuretted hydrogen were passing on to the town and asked what responsibility they were to accept. Clegg said the boxes had not purified the amount of gas he would have expected them to purify, and that when he was at Burnley, as Deputy, he had to accept responsibility for purification.

Visit to Town Clerk.

On Jan. 19 Marchant (another chemist) and he went to see the Town Clerk, because they felt disappointed and anxious that they had not had any direct communication, or had not heard of an indirect one, from Clegg up to the date when they went to the Town Clerk.

"We still had to fight for purifiers to be changed," said Grainger. "We had no guarantee that a similar situation of crisis would not arise again, and in view of the possibility that such an occasion might arise again we had taken the advice of one whom we considered, and still consider, was capable of giving us advice," he added.

Mr. Shawcross: When you say you would have to fight, who would you have to fight?—Mr. Plevin had been the subject of several approaches in regard to the last purifying box which had been changed, and had refused to change it until we had approached him several times. It was put off Jan. 7 and reinstated on Jan. 10.

Witness said when they raised the question about purification with Clegg on Dec. 30 and Jan. 6, he led them to expect they might receive assistance from him.

Mr. Shawcross: As far as you could see had he, in fact, given you any assistance in regard to changing the boxes?—No.

Cross-examined by Mr. Crichton (for Plevin), Grainger said that all the information in regard to the manufacture and purification of gas came from his 14 years' experience at Crowlands.

Mr. Crichton: The whole of your experience in gas making has been tainted with irregularity, has it not, Mr. Grainger?—I think I should prefer some qualifying degree there. I would not say the whole of it.

In that the declared calorific value of gas was never attempted to be produced at your works, is it not true to say the whole of your experience has been one of illegal working?—In one respect—calorific value.

When you altered the Boys calorimeter in August, 1937, was that an original thing for Crowlands?—Yes.

Never done before?—Not to my knowledge.

Witness said he could not recollect any book containing analyses of gas and tests between September, 1935, and January, 1937. It might be that no tests were recorded during that period. He did not remember recording any tests during that period. When Plevin came he immediately required them to record tests, which were for his guidance in control of the works.

Constant War.

From Plevin's arrival until January, 1938, there was a constant war between the chemists and Plevin in regard to the matter of air for the purifiers. Before Plevin came the calorific value was low, but the practice was to admit a normal amount of air to the purifiers. After Plevin came his constant injunction was to increase the admission of air to the purifiers over and above what it had been before he came.

Grainger did not agree with a suggestion put by Mr. Crichton that the whole of the period from Plevin's appointment to January, 1938, showed upon the part of the chemists a record of equally consistent and intentional disobedience of Plevin's instructions in regard to the matter of air admission, although he agreed there was a considerable number of occasions during that period when the air supply was completely shut off. When this was done, he said, it was not in defiance of orders, but to supply gas of a higher calorific value for tests. He had no recollection of Plevin constantly complaining about the shutting off of the air.

Witness agreed that a note from Plevin on Feb. 12, 1937, was a typical example of the complaints and injunctions made by Plevin to the technical staff and foremen in regard to the question of air admission. Things went so far that in September, 1937, Plevin ordered the entire removal of the air slide. Plevin was the proper person to give orders, and if the air slide was closed witness agreed that that would indicate disobedience on the part of the staff.

Grainger, continuing, said it was true that unauthorized alterations had been made to the rate of the extractor variable gear, and that Plevin complained about them. He complained to the extent that in November, 1937, the extractor gear was padlocked.

Grainger said the maintenance of proper scurfing was also essential to produce a maximum yield. Plevin, since his appointment, had on many occasions to complain to the technical staff about the failure to maintain and test setting heats and to carry out proper scurfing operations. He agreed that Plevin had great difficulties to contend with in breakdown of plant. Having regard to the difficulties at the works with which Plevin was faced, witness thought that he (Plevin) was justified in relying upon the chemists to do their duty.

Mr. Crichton: I think you will agree that Mr. Plevin was trying his best to put matters straight?—He instructed me, for one, to use the special holder.

I think you will agree that as far as what one might call the illegalities were concerned Mr. Plevin was doing his best to put these matters straight?—No, I could not agree to that.

Witness said he would agree that Plevin was doing everything in his power to eliminate the mechanical difficulties and to increase the efficiency of the staff by allocating to each member a definite responsibility in a sincere effort to obviate the necessity for the alleged illegalities.

That concluded Mr. Crichton's cross-examination of the witness.

Grainger was then questioned by Mr. Blackledge (for Clegg). He said that in the ordinary course it was the duty of the chemists to maintain calorific value. Up to the end of 1936 the calorific value was reasonably steady, averaging 460 and 465 B.Th.U.

Witness was handed the foremen's carbonizing book containing calorific value figures from Dec. 1, 1927, onwards. He quoted the following calorific values: Dec. 1, 441; between Dec. 1 and 11 there was no average value calculated in the book, but the daily average for Dec. 12 was 439; for Dec. 13 the value was 449; 14, 444; 15, 438; 16, 427; 17, 435. Witness agreed that subsequent figures were very little better.

INSTITUTION OF GAS ENGINEERS

A SPECIAL General Meeting of The Institution of Gas Engineers was held at Gas Industry House on March 14 for the purpose of presenting and discussing the Paper on the subject of " Deterioration of Coal in Storage " by James Jamieson and W. J. Skilling, extracts from which we gave in the "JOURNAL" on March 1. The President (Mr. Robert Robertson) was in the chair. The following is a full report of the Discussion.

Deterioration of Coal in Storage

Dr. E. W. SMITH (Woodall-Duckham Companies): I am glad to have the opportunity of underlining the importance to the Gas Industry of encouraging in all ways possible research work within the Industry where facilities are available, and especially when it can be done in collaboration with the highest authority in the land, the Fuel Research Station.

The difficulty I find in discussing this Paper is in the fact that Mr. Jamieson and his collaborator completely knocked the ground from under one by pointing out many times the anomalies and the difficulties of research work of this kind, but if there is one thing more than another that they have done it is to confirm what many people have experienced and some of us have guessed, that the weathering of coal is of importance in many cases to the Gas Industry and to the coking industry. Gas undertakings have to store coal, and it is usual to carry stocks of from one to six months' requirements. When it comes to the coking industry I feel it is entirely unreasonable to ask them to carry stocks of coal for the same reasons of maintaining continuity. The coal is at their doorstep. There is no question of railways and there is an unlimited supply. The only difficulty is the possibility of a strike at the pits, but in my view it is not a very serious one.

The weathering of coal, as has been pointed out, is important primarily from the point of view of coke quality. That is of primary importance to the coking industry and of some importance to the Gas Industry, but as the majority of coals used in the Gas Industry are not coals that are near the margin it is doubtful whether, from the point of view of coke quality, the time that is occupied by coal in storage is of very much significance. In connexion with the anomalous results from a gas-making point of view in a continuous vertical retort, I cannot help but feel that the primary reason for the changes in results can be put under one or two heads. One is that a coal that is near the border line gives a coke which becomes smaller, and it is well known, particularly in Scotland and Derbyshire, that the results vary with the sizes of the coal put through the retort. If poor results are obtained, very often you can trace them to the fact that the coal is too big for the retort and that slight variations in size very materially decrease the thermal yield, and even the calorific value if the steam is under control, so that if the effect of weathering is to reduce the coking quality of the coal one would say that the coke is reduced in size and that the coal breaks up earlier, and that there is an actual higher carbonizing efficiency.

Unexplanable Anomalies.

I should like both to congratulate the Authors and to sympathize with them because for anyone to have the courage to write a Paper when they have all their data before them and to put forward conclusions of the type the Authors have, knowing from the beginning that there were anomalies which could not be explained, needs sympathy for the Authors and courage on their part. Too many technical men fear to publish their results because they are not completely finished. Too much material is left in notebooks which would be very informative, whatever the conclusions you might draw from it, if only it was published. These two Authors have published a great deal of information which should be very valuable, particularly from the point of view of difficulties with testing.

Difficulty of Obtaining Reproducible Results.

If large works, wherever possible, will install test installations of one or even four retorts, I am certain they will prove invaluable to the undertaking, but it should not be thought that by doing so it is likely to be possible, particularly with continuous vertical retorts, to reproduce results with any precision such as fundamental workers must require. With continuous vertical retorts, one retort is worse than four. I have no faith whatever in reproducibility even if you could be sure of the very same coal going through, if you are desirous of obtaining the type of information that these two Authors have attempted to obtain. The coals cannot be relied upon. There is a difference in the sizes of the coal in the heaps, and whether oxidation will occur depends on the size of the coal. Then there is the impossibility of controlling conditions in one retort sufficiently closely, years apart or even only a few weeks apart. This makes it, in my view, impracticable to try to obtain reproducible results.

When I was in Birmingham, and prior to 1920, we used to carry out tests to determine what we knew in those days as calorific value multiples—the evaluation of coals—and we always used to take the average of the last three tests. No test was less than a week and the differences between the last three tests on the same coals, with the same ash content within ½ per cent., were sufficiently great to prevent the last test being taken as indicative. In actual practice where you may have 100 retorts, these variations balance themselves out and it is highly probable that with the same coal from the same colliery over a period of weeks a gas undertaking will produce the same therms per ton of the same calorific value quite readily, but when it comes down to one retort, or even four retorts, I can sympathize with Mr. Jamieson when he tries to reproduce the results.

Finally, I should like to ask if the Fuel Research Station can tell us whether it is practicable to store coal under sea water. One has heard of processes in which salts are used for cleaning coals, and in America recently it has been proposed that coals should be stored under sea water. I should like to ask whether there is any information available which would indicate that the chloride content of the coal is increased to an extent which it is not economical to wash it out in the normal way.

A Model for Others.

Dr. H. HOLLINGS (Gas Light and Coke Company): I had the privilege last year of seeing something of this work being carried out in Edinburgh, and so far as the arrangements for the storage and sampling of the coals are concerned, I do

feel that this investigation will serve as a model for quite a number of other workers in the future.

Turning to that part concerned with the coal carbonizing trials, in work of this kind, of course, it is a relatively simple matter to discern what has been the effect of storage upon the quality of the coke produced, but it is quite evident that the Authors have felt some little difficulty in finding a simple mode of expression of the effects of storage upon the gas-making properties of the coal, because of the variations in the inert and water gas content of the various gases produced. The calculation of the hydrocarbon enrichment value, which was first used by Pexton some years ago, however, overcomes this difficulty since the hydrocarbon enrichment value is the product of the inert free volume of the gas and the calorific value of about 318. I have had the hydrocarbon enrichment values calculated for the various tests described in this Paper, and they are set out in the accompanying tables.

I.—Results in Experimental Retorts

No.	Coal.	Months' Storage.			
		0	15	25	45
1	2	3	4	5	6
	Low Caking Coals:				
1	Four Feet	33·2	31·2	31·0	31·9
2	Great A	30·9	28·2	27·2	28·6
6	Great B	31·6	30·9	27·8	29·0
12	Nine Feet	30·9	29·8	27·6	27·6
13	Wilsontown Main G	30·6	29·9	26·2	30·6
19	Bow House	30·4	29·9	28·4	27·2
	Average	31·3	30·0	28·0	29·2
	Caking Coals:				
3	Six Feet	36·7	35·1	33·7	33·4
4	Allanton Upper	38·4	33·7	35·2	34·6
8	Wilsontown Main A	33·3	33·0	34·0	33·2
9	Wilsontown Main B	37·0	34·6	32·9	31·4
10	Shotts Gas	35·5	33·5	33·7	35·2
11	Twenty Inch	32·9	32·8	32·3	34·1
15	Bannockburn Main A	34·4	33·9	31·6	34·0
16	Bannockburn Main B	31·2	32·8	31·1	32·8
17	Kilsyth Coking (Mecklehill Main)	32·5	30·6	29·1	30·0
18	Lochgelly Splint	33·6	33·2	33·9	32·7
20	Diamond	33·6	33·7	34·9	35·5
	Average	34·5	33·4	32·9	33·4
	"Cannel" Coals:				
5	Parrot	43·5	40·5	42·2	42·9
7	Parrot Cannel	62·4	60·4	57·4	58·1
14	Kilsyth Coking	36·1	35·3	30·1	35·8
	Average	47·3	45·4	43·2	45·6

II.—*Results in Woodall-Duckham Vertical Retorts*

No.	Coal.	Months Storage.	
		0	42
1	2	3	4
1	Four Feet (Low Caking)	35·8	34·8
2	Great A (Low Caking)	33·0	30·4
4	Allanton Upper (Caking)	35·9	36·2
6	Great B (Low Caking)	31·4	31·6
7	Parrot Cannel	42·3	47·8
8	Wilsontown Main A (Caking)	34·2	30·1
9	Wilsontown Main B (Caking)	33·2	32·2
	Average	35·1	34·7

I suggest to any future workers in this field that they should consider carefully the desirability of using these calculations in the checking and interpretation of results as the work proceeds, since the hydrocarbon enrichment value does indicate the variation in the value of the coal when considered from the gas-making point of view. For example, I think you will see that the figures I have given indicate the difference between the splint coals, which appear to stand up to storage very well, and some of the others, but may I say on that point that I hope some day we may have the observations of those who do know the individual coals concerned.

One point which has emerged from my calculations is that the hydrocarbon enrichment values in respect of the tests carried out in the small experimental plant after 45 months' storage are higher than the values calculated from the tests after 25 months' storage. It would appear to me that this anomalous result is due to the circumstance pointed out in the Paper—*i.e.*, quite drastic alterations were made to the heating system of the experimental retort setting between the two series of tests. If that is so, and that is the explanation of these higher hydrocarbon enrichment values after 45 months than after 25 months, then I would really question whether the particular series of results in the small plant after 45 months are strictly comparable with any of the other test results in the Paper. I would like to have the observations of the Authors on that point.

Coal Not a Uniform Material

Dr. R. LESSING: Whenever one deals with coal I think one must expect anomalies in the results and that is in the first instance due to the fact that we have not in coal, however well selected and however well sampled, a uniform material, but a very heterogeneous one, and on that score one cannot but expect anomalies in the behaviour of the coal on carbonization. Both the previous speakers have referred to the difficulty attaching to repeatability of results in retorts on account of the very many factors which have to be taken into account and must be controlled in doing that work. I believe, however, a very great deal can be learned, in spite of that, by even looking at what has happened to the coke, and to a certain extent from the gas-making point of view which, of course, is the more important side of the carbonizing process by reason of the fact that, in carrying out that process, you have of necessity to sub-divide your organic material into the solid residue and volatiles, both liquid and gaseous.

As regards the general results, where they agree throughout the tests they confirm the known fact that coals of a relatively high oxygen content are more liable to further oxidation than coals of a lower oxygen content. We have known that phenomenon for many years and the Authors have proved what actually happens. The increase in oxygen content causes a reduction in caking power, and to a certain extent in thermal gaseous yield.

One difficulty which strikes me, in spite of the very careful preparation of these samples, is that the grading of the coal samples, using 10-ton samples, is to a certain extent an uncontrollable factor unless you carry out the experiments with carefully graded fractions. If this work is carried on, as I sincerely hope it will be, I suggest that first of all the Authors should deal with graded fractions although they may not at present quite represent commercial deliveries. I am convinced, however, that they will in the future when they will show more definite results. Another point, of course, is to have coals of a more uniform character or, shall I say, less heterogeneous composition in regard to both coal constituents and inert constituents and mineral impurities.

What I have said so far relates to the necessity for having more uniform samples to deal with and tracing down the phenomena which are observed in the individual components of what our great mixture of coal represents. As regards the mineral side, one very important factor lies not so much in the outside dirt which represents the bulk of the ash in the coal, but rather in those peculiar veins—the mineral partings as they are called in England, I do not know what they are called in Scotland—which are mainly caused by the passage of water percolating through. As a matter of fact, the Authors fully recognize this because in their introduction they say "the more heterogeneous the coal, especially if the heterogeneity is due to mineral partings, the more marked the disintegration." These partings consist to a large extent of the carbonates—calcium carbonate and iron carbonate—and it is the iron in these thin veins which is liable to the first oxidation. In oxidizing, it splits open the coal and disintegrates it. We know from the consideration of spontaneous combustion, and particularly gob fires underground, that the more finely divided the coal is the more liable it is to oxidation and weathering. Therefore, these mineral veins have a twofold effect. First of all they split up the coal by their own oxidation, and having split up the coal they expose a greater specific surface of the actual organic coal substance and allow that to be oxidized.

There is a line of further investigation which I think should be followed and it can only be done by careful selec-

tion of coals, because there is one point on which we do not really know anything of an appreciable character yet. It is to what extent the oxidation of the mineral substance, particularly the iron, may also catalytically influence the oxidation of the contiguous coal substance itself—*i.e.*, how far the oxidation of the organic material is influenced by the inorganic material. I think in this respect one would like to have further information which can only be obtained by this careful and laborious procedure of exposing coal for years and finding the results.

Splitting Action of Minerals.

In conclusion, I would like to raise the question of the coke and the dependence of the grading of the coke on the weathering. In Table 13 the percentage of size coke from certain coals before and after exposure is given and the results are, as one would expect, very remarkable in the direction that the small sizes of coke increase when carbonized from coal which has been exposed to weathering. That again, to my mind, is largely due to this splitting action of the minerals within the lump of coal. Having been split open in weathering, the expanding action proceeds in the course of carbonization, and you are bound to work in the direction of smaller sizes of coke and in the direction of breeze. Some of those present may remember the very carefully carried out experiment which I had the honour of bringing before the Institution, I think in 1931, on coal which had been supplied to a London gas-works with something like 8 per cent. ash content varying down to 1 per cent. or very little over 1 per cent. The most remarkable feature of the carbonizing results at that time to me, at any rate, was the enormous increase in breeze yield from the uncleaned coal as compared with the clean coal. It would be interesting, if the samples are still available, if we could have the ash content of the three grades of the cokes mentioned in Table 13 before and after exposure. I am not quite certain to what extent the last Table in the Paper differs from Table 13.

Mr. JAMIESON: That refers to large retorts and the other relates to small retorts.

Dr. LESSING: Otherwise they work in the same direction and the figures are really in remarkable agreement with each other and indicate to my mind the very great deal that is to be learned from the whole investigation.

I must say I was fascinated by the results obtained and although they may show certain discrepancies it would be rather premature to dismiss these results. On the contrary, we should try and find other points by which they can be explained. It is really only by failures that we learn, and I hope the investigation will proceed on these lines.

Storage of Coal and Boiler Operation.

Mr. G. W. HEWSON (Chief Chemist, London Power Company): This Paper has a much wider use than only in the Gas Industry. For those who produce metallurgical coke and for manufacturers of iron and steel who use such coke, the Paper must be of great value in explaining inconsistencies in the production of coke, while at the same time making them aware of the undesirability of keeping large stocks of fuel against emergencies arising from inadequate deliveries of newly won coal. The deterioration of coal in storage has recently been one of the causes of serious irregularity in boiler operation at a power station with consequent intensive investigation into the cause. The boiler plant in question burns nearly 500,000 tons of coal per annum. This coal has been washed before delivery and is of a size with 90 per cent. passing ½-in. mesh, and 40 to 50 per cent. passing ⅛-in. mesh. For a period of about five years freshly delivered coal has given satisfaction, and even coal stored for a short time has not given trouble. During last summer a large quantity was put into store, while some of the deliveries were burned as soon as received. The material taken from store became increasingly difficult to burn efficiently and did not coke as readily on the stokers which are of the retort type.

Four differently named coals were in use, and I will refer to them as A, B, C, and D. The caking indices were:

Coal A	15 to 16
Coal B	about 5
Coal C	11 to 12
Coal D	*Nil*

These coals were supplied as two different mixtures in the proportions of 75 to 80 per cent. of A and 25 to 20 per cent. of B for one mixture, and 75 to 80 per cent. of C to 25 to 20 per cent. of D for the other. They were all from South Wales with 12 to 14 per cent. volatile and 6 to 8 per cent. ash as delivered.

It might be thought that coal for boilers does not need to be of a coking nature. Practice, however, demands a certain degree of caking soon after reaching the fuel bed, otherwise the fines are carried away by the air blast before they are completely burned. Irregularities in the fuel bed which may be produced in this way are apt to result in intense local heating with consequent clinkering. The choice of coal with a suitable caking index is a really important point in the operation of retort-type stokers. The evidence given in this Paper that a coal which may be satisfactory when freshly mined may lose its useful caking power when stored is therefore valuable to those who have to select coals for this class of stoker.

One would expect the size of the coal to influence the rate of degradation on storage, partly by modifying the ventilation and partly by changing the area of exposed surface. Most of the coals used for the experiments described in this Paper were screened over 1¼-in. square mesh. It would be interesting to know if other experiments have been made with small coal. It is also interesting to note that coals of low caking index deteriorate more rapidly than those of comparatively high caking index, and, further, that small coal loses its caking properties sooner than larger coal.

It is surprising to learn that the calorific value is not generally affected by storage, and I would like to know if comparative tests for calorific value have been made upon other coals than those quoted by the Authors.

Theory and Practice.

Mr. JOHN CURRY (President, Coke Oven Managers' Association): I do not propose to criticize the Paper very much, but there are one or two points which strike me. The tests of the coal have been carried out after passing through 1½-in. screen and that, to my mind, would not be commercially possible. Durham coals, as you are all aware, are very soft and easily break up on handling, and if this test had to be carried out on large quantities of Durham coal, I should imagine that with the run of mine coal something like 60 to 70 per cent. would go through the mesh and only 30 to 40 per cent. over the mesh. As Dr. Smith has pointed out, coke ovens do not, as a rule, store coals because they have the coals at their doorstep, and not only do we not store coals on that account but coke, from the coke makers' point of view, is of paramount importance. We as foundry coke makers lay the greatest stress on the quality of the coal, and from past experience we would not consider storing coal because of the variation and the effect that it would have on the coke produced.

The Authors have subjected the coke made from the weathered coal to a series of screen tests. That is a very important test and shows quite clearly the effect of weathering after 42-43 months, as given in Table 21, but what strikes me as equally, if not more, important is that no mention has been made of the physical properties of the over-size coke. Screening, whether by hand or machine, is a good test, but from the coke-oven point of view, where the coke has to be handled and exported, probably that test would not be sufficient and would not give adequate data from which to draw any definite conclusions as to whether we should use a weathered coal or not. Looking at Table 21, the increase of breeze is very marked after the weathered coal test had been done and, as the Authors point out, this has a serious effect upon the thermal value of the gas, or what would have to be charged to the gas on account of the amount of breeze made. On a rough calculation from these figures it varies from 15·4 to 43 per cent., the average being 22·9 per cent., and taking coke at 30s. per ton and breeze at 7s. per ton, that gives a figure of 2s. 6d. to 3s. 6d. per ton of coke, which represents 7 to 9 per cent. on the capital cost of a plant carbonizing 900 tons of coal a day. This would eliminate any question of using weathered coals for coke making. The Authors have put forward a very instructive Paper, and to my mind, as a coke-oven man, it proves that we should not store coal for coke making.

A Courageous Task.

Dr. J. G. KING (Fuel Research Station): I had the privilege of watching this investigation at intervals through its different stages, and I can assure you that the Authors have accomplished no light task in obtaining all this information. As Dr. Smith has pointed out it does require a great deal of courage to put down results which show curious anomalies at different points.

I think we must all agree that the behaviour of coal in storage is a matter which interests all large consumers of coal. When coal is to be used as a fuel, importance attaches mainly to the possibility of storage under conditions safe from fire, since, if self-heating can be prevented, loss of calorific value is a relatively slow process, and tends to be less. We have figures, for example, which show that under conditions which allow the full amount of heating, the loss of calorific value is of the order of 0·5 per cent. per annum. The Authors indicate 0·15 per cent. per annum under conditions which have avoided self-heating. Other experiments which I have seen indicate figures as low as 0·05 per cent. I think the question was asked tonight what was this loss. The loss is, in the absence of heating, between 0·05 and 0·1, and with heating about 0·5 per cent. per annum.

When, however, the coal is to be used not as a fuel but as a raw material, storage presents quite a different problem since some property of the coal which may be of the greatest interest to the industry concerned may be modified so rapidly as greatly to reduce the value of the stored coal. In the case of the Gas Industry Mr. Jamieson has done something which is particularly interesting in that he has studied coals which have a very small reserve of caking power—*i.e.*, Scottish coals which after a certain length of storage lose their caking power to such an extent that they are practically valueless for coke making.

Nothing has been said yet about the heating of coal on storage. Under the conditions used by Mr. Jamieson with heaps of several tons of coal, it is apparent that self-heating was avoided. We all know that if the temperature of the coal rises, the rate of deterioration, or shall we say oxidation, increases rapidly, but in the Authors' case the temperature did not rise, presumably because the heat was small and the ventilation was efficient. The Authors' results apply only to those conditions of storage in which self-heating is avoided. I know that Mr. Jamieson realizes this limitation, and I know also that he would have liked to carry out experiments on a really large scale in order to bring in this factor, but of course he has to limit his experimental work in some connexion and I think it says a very great deal for him that he goes as far as he does. He has pointed out the considerable changes which can occur with particular reference to caking power even in the absence of self-heating, and he raises the interesting question as to whether conditions might not be further modified so that the extent of the change might be still further reduced.

Storage of Coal Under Water.

Reference has been made by Dr. Smith to the storage of coal under water and that is a condition such as might bring about a reduction of the extent of the change. But generally in the storage of coal there are two conditions which avoid self-heating: one is no ventilation at all, such as storage under water, and the other is over-ventilation. Between these we have the dangerous condition in which the amount of air having access to the coal is sufficient to cause heating but insufficient to carry away that heat rapidly enough to prevent the whole heap of coal heating up. In Mr. Jamieson's case he probably had over-ventilation, and it is possible that with a larger dump and with the ventilation reduced well below the dangerous limit, the rate of deterioration of the coal might have been even less than he has indicated. This is an important point because I feel that it raises the question of the study of coal deterioration on a larger scale and under conditions of stacking which would allow both free distribution of air and a limited distribution of air.

It might help the Gas Industry to make an organized attack on this problem by laying down large dumps of coal stacked under different conditions, and stacking in such a way as to bring in all the variables possible. I am sure the Director of Fuel Research would be only too glad to collaborate in this work, and we might be able to assist in analytical work and so on as we have done in the case described by Mr. Jamieson. It would be necessary to lay down fairly large dumps of coal. At the moment we are actually watching a series of experimental dumps containing about 400 tons of coal each in which we have adopted different methods of stacking and different methods of taking out the samples for examination. One interesting method is that we have introduced into the dumps sample quantities of coal in perforated baskets so that the coal which has been analyzed can actually be recovered after it has been subjected to the conditions prevailing in the dump. The work has not yet reached the stage at which we can quote any results. In the case of these particular dumps the point of view has been over-ventilation and the avoidance of fire, because the coal is being stored as a source of fuel and not a source of raw material for coking or anything of that kind. In that case, of course, we expect the coking properties of the coal to be affected to quite a considerable degree and a different technique would be necessary in dealing with gas and coking coals.

Also, through the medium of our Coal Survey, we have been examining the storage properties of coals in the Forest of Dean area which are reputed to be fiery and not to store well. We laid down small experimental dumps of 10 tons each so that again we have the conditions of free ventilation and absence of the possibility of self-heating. We laid down two sizes of coal—namely, 2 in. to 1 in., which is graded coal, and a small coal ½ in. to 0 in. As to how this small coal behaves in relation to the large, I can give you one or two figures. In the larger coal, after a period of 2½ years, we detect no difference at all in the analysis of the coal, but we do detect a difference in the caking power as measured by the caking index. I should like to make the point here that in the variation of coal the property which shows the first change is the caking power, and you can detect by careful assay and examination of the coke in the laboratory small changes which it is impossible to detect by analysis, even the most careful analysis. In the case of the 2 in. to 1 in. coal we found that the rate of decrease of caking power which we were able to notice was about one-quarter of that in the case of the slack coal.

With other small dumps at the Fuel Research Station we have made a great many observations which show that a highly caking coal of the type used for coke manufacture would lose its caking power at such a rate with free ventilation that it would become non-swelling, though still strong, in only twelve months. That seems to bear out the statement which was made in respect of coal for coking purposes, namely, that it should not be stored.

Storage and Calorific Value.

With regard to calorific value, the large coal—*i.e.*, 2 in. to 1 in.—lost only 20 calories per gramme during the year, whereas the small coals lost 270 calories per gramme, more than ten times as much. It is interesting to observe that about two-thirds of this loss of calorific value is due to the effect of simply adding oxygen. The heat lost as heat of reaction is only one-third of the apparent loss of calorific value. Something has been said about disintegration, but I am afraid I cannot quote figures in terms of particle size as the evidence is not available yet.

Coating Surface with Oil.

I have one other interesting observation to make, and that is that we have recently examined the American claim that coals can be stored for long periods of time without deterioration by coating the surface with oil. You are all aware, of course, that coating the surface of coal with oil has been suggested as a means of relieving the dust nuisance in the handling of coal, the amount of oil being very small indeed, a matter of 1 lb. per ton. The claim was that oiling coal in this way would retard deterioration. We laid down about six heaps of coal oiled in different ways at the Fuel Research Station, and a control heap of the original coal, and after about a year we found that any kind of oil spraying that we have been able to do had exactly no effect at all. I think it can be said that by methods of storing coal where

free ventilation is prevented, the deterioration is reduced. In connexion with the mention by Dr. Smith of the storage of coal under sea water, many years ago the U.S. Bureau of Mines carried out a long investigation in which they stored coal under sea water in a creek and examined the coal at various periods, and they were able to record that the variation which took place was very small, smaller, in fact, than had the coal been stored dry.

Unfortunately at that time attention had not been directed to the effect of chlorine in coal and they had not measured the adsorption of chloride into the coal. That is a matter of relatively recent knowledge. We have found, for example, that certain coals may contain quite a high proportion of chlorine, the total being as much as 1 per cent. sometimes. Whether it is sodium chloride or organic chloride it is difficult to say because it is impossible to take the chlorine out of the coal unless the coal is ground to a fineness giving particles of 1/1,000th mm. One would suggest, therefore, that if coal was stored under sea water it would be necessary to make sure that the sodium chloride was not adsorbed into the coal during storage, because it would obviously be impossible to grind it to the degree of fineness I have mentioned before using it. I am speaking, of course, by inference and have no direct proof of this, but I do know from experiments on high chlorine coals that the chlorine can only be removed by very fine grinding and long extraction by water. In this way, storage must definitely differ from any process of coal cleaning such as that of Dr. Lessing where the coal is floated in a solution of calcium chloride. In that case the coal is only in contact for a short time and is immediately washed so that the chloride solution has no time to become operative. In the other case, the storage period may be long and then there is plenty of time. The evidence which I have for saying the chlorine is adsorbed is that we have excellent coals which have been treated by solutions of lead salts before and after treatment by X-rays, and we have been able to show that the coals rapidly adsorb the lead salts by capillary attraction. If they do that with lead salts they must also do it with a sodium solution to the same extent.

Finally, I would return to the suggestion I have made that it might be a good idea for the Gas Industry to do some work on a really large scale and examine methods of stacking coals and try to find a means of storing coals in such a way that the deterioration of the caking power would be considerably reduced. I do not suggest that this work should be of the magnitude of that carried out by the Authors, but I do not think the Industry should be frightened by the many figures reproduced in the Authors' Tables. Very probably the number of tests could be greatly reduced and perhaps even confined to caking power alone, and the amount of laboratory work involved would be relatively small.

Temperatures of Coal Storage Heaps.

Mr. J. E. DAVIS (South Metropolitan Gas Company): In the South Metropolitan Company we have had a fair amount of experience in the storage of coal as, of course, all the larger undertakings must have, but we have never dared to publish anything, because it did not make sense. In many instances we have tried to find out why some of the results obtained in carbonizing coal could not be explained by laboratory examinations. One of our first attempts in laboratory work was to store small samples—1 lb. or so—of coal for 18 months or 2 years at ordinary atmospheric temperatures. Then we carried out laboratory assay tests on the coking properties, and it is these, as the Authors have shown, which are the first to indicate a marked variation. The calorific value of the coal showed very little variation, and frequently the yield of gas from one coal to another was nothing like as large as the variation which the people who make the gas on the works know very definitely occurs.

One factor that we omitted was the tendency of the coal to heat, as Dr. King pointed out. We then wanted to know to what degree coal would heat if it were stored in a heap containing, perhaps, 250,000 tons. Dr. King has made the suggestion that perhaps the Gas Industry might like to put down some heaps of coal in different parts, and I must admit that I rather had the same idea myself once, that we might take a shipload or half a shipload—perhaps 1,000 tons—and put it down somewhere and compare it with a heap from another shipload somewhere else, making one heap a deep one and the other a long and shallow one. But what, asked the carbonizing engineers, are we to do with that coal when it has all been messed up for us? That is the big point. If the proposed method of storage is a good one and the coal is better afterwards, then all is well, but 1,000 tons of coal is a big item, and what I think we have to do is to overhaul our methods of determining temperatures in the coal storage heat.

We have a system which is traditional in some respects, but is improved from time to time. If you have heaps 20 ft. in depth it is quite impracticable to take exact temperatures at regular intervals, but by test rods with experience you can gauge the temperature within a little, and as soon as a hot spot is suspected, water is put on it. We have found by putting thermometers inside some of these test rods that the coal did not exceed a temperature of 120° F., because if the heat was such that it was not comfortable to hold the rod, water was immediately called for. We are now repeating these results on a small scale, maintaining the coal for a period of years at temperatures up to 120° F., but there is still a great deal to be learned on this point and particularly with regard to methods of storage.

I will give you an example of what may happen, and I would not dare to do more than give it as an example. During the coal strike of 1926 we had a considerable quantity of American coal at one of our works. A good deal of that coal was put into an inside store and compacted really hard. About 8 years later we were rather curious as to what it would be like, and we bored holes in it. I got into trouble for being so expensively inquisitive, but to our surprise the coal stored in that way with practically no ventilation was almost as good as when it went in.

Obtaining Right Coking Power.

Dr. G. E. FOXWELL: In reply to the Chairman's invitation, I can describe some observations made a good many years ago that have a bearing on the subject. In those days I was analyzing coals from all parts of the world with a view to using them in coke ovens, and it was especially necessary that the sample received should have the coking qualities that the coal would possess shortly after mining when charged into the ovens. The time that elapsed between the sample leaving the pits and being received by me was dependent on the Railway Companies and may have been between 3 days and a fortnight. Generally there was not much difficulty, and the good coking coals retained their coking properties unaltered, even when the sample consisted of fine slack. Certain of the poorer-coking coals, however, oxidized so readily that unless they were despatched in airtight sealed tins no reliance could be placed upon the coking power even after these few days.

Mr. Jamieson will be interested to hear that perhaps the most difficult of all these coals were from the southern portion of the Scottish coal-field. These would appear to be possibly capable of carbonization in the coke oven if transferred direct from mine to oven within a few hours, but could not be allowed to remain exposed to the air for periods much longer than this. The rate of deterioration of the quality of the coke, therefore, depends upon the character of the coal, and I should say as a general rule that the greater the quantity of adsorbed moisture—*i.e.*, the less the coking power of the coal, the more rapid would be the change in coking properties. This, of course, would not apply to steam and anthracitic coals.

Naturally, the oxidized coals gave reduced yields of tar and gas, but I have no figures by me. I have, however, had an experience of the rate at which the gas-making properties of certain coals can deteriorate. At a certain Derbyshire coking plant which had been closed down, I had the task of heating up the ovens and setting the plant in operation. Slack coal of not very good coking properties (relatively) is carbonized generally in Derbyshire, and this plant was no exception to the rule. The manager of the coke ovens warned us that we must only attempt to start up on freshly mined coal, but unfortunately here was an accumulation of coal a fortnight or three weeks old in the service bunker, and the colliery management insisted that we must start on that coal. The result was that, when we came to charge the coal into the

oven, it gave so little gas that we could not retain our heats nor build up a carbonizing temperature, and we had to close down and start up again. This time we had fresh coal, and no difficulties supervened.

This observation does not mean necessarily that the coal lost its gas-making properties; it may be simply that there was a re-distribution of the gas yield over a different temperature range. It is well for me to make clear what happens when a coke oven is started up. The oven is heated by a coal fire on a false hearth in the oven chamber, and when the battery has reached what is believed to be a sufficiently high temperature, the door is removed, the false hearths pushed out by the ram, and the oven charged with fresh coal, the gas passing into the mains. Naturally, by the time all these operations have taken place, the oven is cooled considerably, and as no gas is being burnt in the flues it becomes cooler, and in effect the coal is carbonized at a low temperature. Other ovens are charged at regular intervals, and it may be several hours before gas has got round the plant and it is safe to begin to burn it in the flues. Consequently, failure to start the ovens in this instance means simply that it was more difficult to distill gas from the coal, and it may be that it is the yield at low temperatures that is first affected. The coking power of coals depends to some extent on the presence of material which is known to decompose at about 380° to 450° C., so that the deterioration of coking properties and the apparent loss of gas-making power at low temperatures may be inter-related. The experience seems interesting as illustrating the susceptibility to oxidation of some coals.

The Authors find little or no diminution in the C.V. of the coals; what, however, of the total C.V.? Oxidation is not only the addition of oxygen to the coal, but the subtraction of carbon in the form of oxides of carbon and of hydrogen in the form of water. How was the C.V. per pound of coal laid down affected? This seems to me to affect the gas-making properties of the coal as much as the actual change per pound of coal as analyzed. After all, it is the pound of coal laid down that the gas undertaking pays for. Perhaps this point could be taken into account by weighing the coal before and after storage, though one sees the difficulties in doing so.

Bannockburn coal was mentioned by the Authors as only slightly susceptible to oxidation, if I read their figures aright. I can confirm this, as I was in charge of coke ovens carbonizing this coal some 25 years ago. The experience of the coking industry is that while, as the Authors say, a good coking coal is not particularly susceptible to oxidation, nevertheless changes do occur, and no coke oven manager would willingly store coking slack for some months if he was expected to make furnace coke out of it.

Mr. P. B. NICHOLSON (Hon. Treasurer, Coke Oven Managers' Association): I did not intend to intervene because I have not had any experience of the storage of coal, but some considerable time ago in connexion with the Blast Furnace Research Committee of Sheffield University, Dr. Mott asked me if I would send him a sample truck of Silkstone ½-in. slack. This was sent to him and he wrote to me as follows:

> "We have just completed a test on the Silkstone coal you sent us last July. The results on this particular sample coked at intervals are [given in Table below]:—
>
> "You will see that at 9 months the coal is still as good as when we received it, and this fact is of great help to us in our experimental work, for a poor coking coal cannot be kept longer than a month. We will continue these storage tests."

I have only intervened tonight because I thought perhaps Dr. King, who has the opportunity of getting Silkstone coal from eight or ten collieries in South Yorkshire, might experiment with this coal in order to see whether it is an exceptional coal in that way.

Authors' Reply.

Mr. SKILLING: Mr. Jamieson suggests that it would be much more satisfactory if we took time to consider the discussion and reply to it in writing. A tremendous number of points have been raised which will take some considerable time to think over and reply to. There is, however, one point with regard to the size of coal that has been mentioned—namely, that 1½-in. coal was excluded. It was not really excluded. The coals were passed over a 1½ in. screen and we tried to get an indication of the deterioration which had taken place during storage, but it was always put back again before carbonization took place. There are a number of points that we want to consider and there are also a great many more calculations that we feel we can make as a result of this discussion. It is possible that we may be able to elucidate many of the points and perhaps clear up some of the anomalies which we thought existed, but which perhaps do not exist. Moreover, we still have more than one-quarter of the coal left on which we can experiment, and we may find out something more then.

Time from Receipt.	Per Cent of Coke on.						Shatter Indices.			
	4 In.	3 In.	2 In.	1½ In.	1 In.	½ In.	2 In.	1½ In.	1 In.	½ In.
1	2	3	4	5	6	7	8	9	10	11
2 weeks	62	80	89	92	94	96	75	82·2	90·2	95·8
10 weeks	62	83	93	95	97	98	72	84·9	93·1	96·9
11 weeks	65	83	93	96	97	99	64	84·0	91·4	96·9
4 months	64	79	92	95	96	98	71	84·9	92·3	96·6
7 months	66	85	91	94	95	97	70	82·5	91·4	96·8
9 months	62	80	90	94	96	97	70	82·0	91·4	96·7

Manchester and District Juniors

The 39th Annual Dinner of the Manchester and District Junior Gas Association was held at the Engineers' Club, Manchester, on Saturday, March 4, and it was followed by a social evening.

In proposing the toast of "The President," Mr. J. T. HAYNES remarked that Mr. Platt had recently been appointed to the important position of Engineer and Manager of the Bolton Undertaking, and everyone wished him the best of health and strength in his new post. Mr. PLATT, responding, said that Bolton had provided the Association with many Presidents. He thoroughly appreciated the honour which had been conferred upon him.

During the course of the evening, Mr. Platt informed the members that the Council had unanimously decided to confer the distinction of Honorary Member upon Mr. George Dixon and Mr. Alfred L. Holton.

Mr. J. GRAHAM (Lancaster) proposed the health of the two new honorary members. He said that it was unnecessary for himself or any other to sing their praises. Mr. Holton had been an active member of the Association for 37 years, serving on the Council for 8 years, and was Hon. Secretary for 4 years. Mr. Dixon had been a member of the Association for 35 years, and was President in 1922-23. He would shortly be President of The Institution of Gas Engineers, an honour in which they all shared. By their consideration for others, and their unselfishness they had helped to forward the Association. The conferment of honorary membership on them was a sincere expression of the Association's gratitude to them for the work they had done.

Mr. HOLTON apologized for the absence of Mr. Dixon. The Junior Associations were of paramount importance to the Gas Industry. The Junior movement would continue to grow and play an even greater part than it did to-day. Both Mr. Dixon and himself appreciated the honour, and they would continue to take a keen interest in the affairs of the Association.

Mr. R. L. GREAVES (St. Helens) proposed the toast of "Our Visitors." They were all glad to see present Alderman C. H. Beswick (Vice-Chairman of the Bolton Gas Committee) who gave them such a warm welcome when they visited Bolton at the commencement of the session.

Alderman BESWICK responded, as also did Mr. A. WYLIE, President of the Yorkshire Junior Gas Association.

During the evening the "W. T. Glover" prize was presented to Mr. E. B. Field (Blackburn) and Mr. F. Bell (Liverpool) for the best Papers read during the last calendar year.

JOINT GAS CONFERENCE DISCUSSION

Retention and Development of the Domestic Load

IN our issue of March 8 we published the four Papers on this subject which were given at the Joint Gas Conference, B.I.F., Castle Bromwich, on March 1. The Session was held in private, but by the courtesy of the Conference Committee we are able to give the following report of the Discussion which took place. Mr. Robert Robertson presided.

Mr. H. C. Smith, Chairman of the Conference Committee, explained the object of the Meeting. It was to obtain, if possible, some plain speaking on the subject of the disappointing showing made in recent years by "consumption per domestic consumer." The idea was that the four gas engineers (whose Papers we have already given) should, if they thought fit, criticize available gas appliances, and that four representatives of the appliance makers' side should comment on the methods of those who have to sell the appliances, and gas for their utilization, to the public. For example, gas undertakings commonly complain of the price of appliances; appliance makers point to the fads and fancies of individual undertakings which so largely prevent any wide measure of standardization.

Mr. W. W. Townsend, in connexion with the Appendix to his Paper, added: Appendix A has some bearing on what Mr. Smith said in opening the discussion, and I thought it would be interesting for the meeting to know the figures of gas sold per consumer. You will see that the gas sold per ordinary consumer in 1932 was 210 therms and it went down in 1933 and 1934. It rose again in 1935 and 1936, and amounted to 221 therms per annum in 1937. Last year it fell again to 214. The gas sold per slot consumer in 1932 was 82 therms. It was 80 in 1934 and fell to 78 in 1935. That is the lowest point and since then it has been rising, and in 1936 it was 80, in 1937 it was 83, and in 1938 it was 83. The ordinary price of gas throughout was 10·6d. per therm.

The number of water heaters fixed in the seven years from 1931-1938 inclusive was 2,773 sold or hire purchased, and 2,766 hire, making a total of 5,539 fixed during that period. Please do not think that these results have been achieved because our competitors are asleep. In the Appendix I have given the figures for the charges made by the Corporation Electricity Department, and there is a very favourable tariff for water heating going down to ½d. per unit with a time switch. All types of electric water heater are hired and the hire rates are given.

In Appendix B are given the maintenance costs and in connexion with these I would point out that in Colchester we have to deal with a hard water which has a very bad effect on any type of solder. We have had a very painful experience in developing this business owing to the limitations imposed by the effect of our water supply on the ordinary type of water heater, and to some extent that is responsible for the high costs of maintenance. I hope in the future this will be considerably reduced due to the experience we have had. I am giving you the facts to the best of my knowledge, but I am not attempting to explain them away. I would like to point out, however, that the cost figures include on-cost and not simply labour and material, because I think that is fair. They are separately shown, and figures are given of the cost per heater. Finally, you get the figure of the capital cost of these water heaters. Interest is charged at 4% per annum and depreciation at 10%. The amount received for hire is shown, and the balance, which is debited against the revenue from gas is shown as £1,607 per annum, or 0·24d. per therm on the whole of the gas sold. I have tried to be mercifully brief and I shall be pleased to answer any questions.

Mr. W. Clark Jackson, introducing his Paper, said:

When the Gas Industry started, it started as a Gas Light Industry, and very many companies still carry that name in their titles, including the largest Company in the world, the Gas Light and Coke Company. Gas lighting which therefore started as the Princess of the Gas Industry is unfortunately now relegated to the position of Cinderella. I am not far wrong when I state that the lighting business in the minds of quite a large number of gas engineers, and also unfortunately in the minds of those guiding the Industry, has been definitely relegated to the position of Cinderella, and anyone who takes the trouble to look round the stands in this rather wonderful Gas Section of the British Industries Fair is bound to realize that gas lighting, as such, has been relegated to a very low position indeed. I personally consider that this is a very serious position for the Industry generally, and in my Address I hope to be able to prove that where a different outlook is taken gas lighting can still play a very large part in the prosperity of gas undertakings.

I think I ought to step aside here for a moment and to state that I consider showroom lighting also to be very important. I have seen many beautiful showrooms from time to time, but the gas lighting as used in them is certainly far from being suitable for the ordinary domestic consumer. This is one of the little garden paths we have been led up, whether by the manufacturers or by our own lack of appreciation of the domestic consumer's requirements, I am not prepared to say. I do consider, however, that it is most important that we should exhibit in our showrooms lighting fittings which are suitable for the domestic consumer. I have always endeavoured to maintain in my Department's showrooms fittings of this nature, and I might say with very considerable success so far as resulting business is concerned.

THE APPLIANCE MAKERS' REPLY.

The **Chairman:** I now have pleasure in calling upon Mr. R. J. Rogers to lead the replies on behalf of the appliance makers.

Mr. R. J. Rogers: In the first place, I would like, on behalf of the members of the Society of British Gas Industries, to express our very keen appreciation for the opportunity afforded to the manufacturers of gas appliances to take part in this discussion on the Retention and Development of the Domestic Load. This is a subject which vitally affects the manufacturers in the Industry as well as the supply undertakings, as we are as keenly interested in the extended use of our appliances as the gas undertakings are in the continued use of gas.

I desire to make it quite clear that the contribution I am privileged to make to this discussion represents not only my personal views and those of the Company that I serve, but also in general represents the views of other appliance manufacturers.

In retaining and developing the domestic load, the aims of the gas supply undertakings and the manufacturers of appliances are so interwoven that in Mr. Dixon's words there is a "need for the closest co-operation by joint realization of the problems confronting both parties." With this expression the manufacturers of appliances are in hearty agreement.

Although it may be considered that it is the duty of the gas undertakings to create the demand for gas consuming apparatus, and that the main function of the appliance manufacturers should be to meet that demand, I think it will be generally admitted that the research and development work which has been carried out by the manufacturers in placing on the market appliances of new design, utility and efficiency, has to a very large extent provided the means by which gas undertakings can stimulate the interests of their consumers in improved gas apparatus.

I trust it will be generally agreed that the primary object of supply undertakings is to sell gas, and the selling of appliances, whether by retail sale, hire purchase, or other means, should be at such rates as to appeal to the varying types of consumers which Mr. Dixon has classified.

If we accept Mr. Dixon's figures as being representative of the Gas Industry generally, we are faced with the situation that 50% of consumers must, because of the gulf existing between initial cost of the black cooker and the average type of enamel cooker, rely upon the former, whereas we must all be convinced that in the interests of the Gas Industry, black cookers should be ousted as far as possible; *there is no black electric cooker.*

In Mr. Dixon's opinion "this gap must be bridged by the production of a cooker of modern appearance in the region of £5." Before, however, I deal with this point in Mr. Dixon's Paper, I would like to direct your attention to the great disparity which

exists in the charges to the public made for goods supplied outright or on hire purchase terms by various undertakings.

Whilst it may be suggested it is not within the province of the manufacturers to discuss the charges made by undertakings to their consumers for appliances, it is such an essential factor in the problem of retaining and developing the domestic gas load, that I may perhaps be privileged to say a word on this subject.

Retail Prices of Appliances.

The manufacturers, from the terms which they have to print on publicity matter for various gas undertakings, are well aware of the anomaly of the greatly varying selling prices of goods. I have no doubt evidence will be forthcoming in this discussion from those undertakings who have adopted the policy of providing their consumers with up-to-date gas appliances at the lowest possible price. Manufacturers know, by their sales to different undertakings, that very large business is effected in those areas where the amount of profit placed on the appliance is reasonable, and on the other hand there is undoubtedly evidence that the general policy of high retail prices restricts sales.

Further, the variation in price existing in closely adjoining towns confuses and annoys consumers, and it would appear to be in the best interests of the Industry in developing the domestic load to standardize the basis on which the selling price of appliances is calculated.

A survey of the various manufacturers' gas cookers in this Fair should, I think, satisfy buyers in the Gas Industry that there are available cookers of excellent design and performance which should meet the needs of all gas consumers, particularly for the sale on hire purchase terms. Mr. Dixon has stated there is a vast market still open for a cooker of modern appearance in the region of £5 and that the production of such a cooker would not affect the better and higher price gas cooker market.

With a view to producing a gas cooker at the lowest possible price, the old-established manufacturers have spent considerable sums of money in research, plant, and propaganda. In addition to the actual cost of materials and labour, it will be appreciated that overheads play an important part in the finance of gas appliance manufacturers, who provide publicity matter, displays, exhibitions, demonstrations, advertisements in the technical and popular Press, and other charges, which are essential in the best interests of the Gas Industry, and which, if not paid by the manufacturer, would have to be met from some other source, assuming that the present efficiency of the Industry is to be maintained. These overheads represent service to the consumer.

It is not always the price at which the appliance is sold by the manufacturer which places it out of the reach of the poorer consumer, but the amounts added by the gas undertakings to such prices, and the position would be greatly improved if the standard prices I have already suggested could be adopted.

If the cheaper form of modern enamelled gas cooker is to be popularized, cuts in profits and sacrifices must not be made solely by the manufacturers, who after all make but one profit, and that is the initial one. Mr. Dixon has emphasized the desirability of standardization. We agree on the great advantage which this gives, but the standardization should not mean the laying down of close specifications of performance, materials, and design, but rather the avoidance in a given design of individual requests for slight modifications which may be thought, by the undertaking in question, to be a definite requirement of people in their area, but which all too frequently are really the expression of opinion of their own officials who have assumed that their own particular preference is also the general preference. Such alterations are costly and defeat the effort made to keep down costs by bulk production.

The majority of these variations do not affect the efficiency of the appliance in the consumer's premises, and manufacturers are confident that a greater appreciation of manufacturing difficulties and costs which would enable them to maintain their standard product, would be in the best interests of the Industry. For every manufacturer to make one type of article would put an end to progress.

Space Heating.

Mr. Currier has been good enough to give us the benefit of his views in regard to space heating. He refers to the all-important question of the efficiency of utilization of fuel, and the contrast between that of gas burning appliances and burning coal in open fireplaces. From the point of view of conservation of our fuel resources and the health of the people, everything should be done to discourage the burning of coal in favour of the use of gas or smokeless solid fuels.

There are many types of space heating appliances covering every possible use, and capable therefore of meeting the requirements of the user far more effectively than solid fuel. Mr. Currier mentions that many modern houses are not fully equipped with flues. It is regrettable, having regard to the fact that flues are as necessary for ventilation as for the removal of combustion products, that the Industry in the past has not been able to convince the Health Authorities of the need for the provision of suitable ventilation flues in all habitable rooms, irrespective of the form of fuel which may ultimately be employed. He also makes reference to the detail of heating appliances in regard to appearance, maintenance, and other factors. He can be assured that the efforts of the appliance manufacturers are not relaxing, and improvements in appearance and performance are always going forward with due regard to the importance of efficiency, utility, and maintenance.

I was very surprised to hear Mr. Currier say that a 7-radiant gas fire cost half as much as a gas cooker, and I must at any rate challenge that, because if you visit the various stands in the Fair, you will find available portable gas fires costing less than 20s. and many inset fires which cost about 30s. We have abundant evidence on the files of the manufacturers showing that fires which are sold at 30s. or 32s. to the undertakings are charged at about £3 10s., fixed, to the ultimate customer, and we consider that the practice is not likely to increase the use of gas fires or the domestic load.

I would suggest that the great problem in space heating is not so much the cost of the appliance as the actual cost of the fuel, which is seldom competitive with that of coal or coke, or even in some cases with electricity. Only if the price of gas is really competitive will the gas fire take the place of the coal fire for living rooms.

Mr. Currier asks "Why not a Central Laboratory?" This question has been raised on many occasions during the past 25 years. The Central Testing Laboratory has been adopted in America and has received the consideration of many investigators from both the supply and manufacturing side of our Industry. The opinion is generally held that the methods of test now existing in this country are best suited to our British conditions. The manufacturers are convinced that the retention and development of the existing goodwill between the supply undertakings and themselves will ensure that the domestic gas load will be maintained and improved in the future and they have requested me to assure this meeting that the Industry may depend upon the whole resources of the manufacturers being utilized to this end.

British Meters the Best.

Mr. C. G. Langford: I should like to preface my remarks by stressing that I speak, not as an individual meter manufacturer, but as representing Section 5—the Meter Section—of the Society of British Gas Industries.

Mr. Currier has spoken of meters this morning and of the need of co-operation between manufacturers and undertakings. Let me say at the outset that meter manufacturers are only too anxious to co-operate in the vital task that forms the subject of this morning's conference—"The Retention and Development of the Domestic Load."

How can we best co-operate? Obviously by studying with you the various problems that crop up from time to time, and doing all we can to ensure that your domestic load is guarded by long-lived, trouble-free meters that protect both the consumer and the undertaking.

Much has already been done in this direction and on more than one occasion during the past years representatives of the gas supply side and meter manufacturers have met to discuss questions of mutual interest, and such meetings have led to a clearer understanding of changing conditions and the best way of meeting them.

To-day we unhesitatingly claim that British meters are the best in the world, both on the score of workmanship and materials used. We back our view by guaranteeing them for five years, and in passing let me say that this guarantee surely is unique. We know of no other engineering mechanism that is offered with such protection. You certainly do not get it with your motor car.

Some attention has been called recently to consumers' meters as a factor in the vexed question of unaccounted-for gas, and there has been a tendency to attribute to inaccurate registration a part of this loss. Meter makers have exceptional facilities for checking the performance of meters from all over the country, and there is no doubt in their minds that within the statutory limits, and providing they are not habitually overloaded, meters do not tend to work slow in service. This is a reasoning fact and certainly does not react unfavourably on the unaccounted-for gas figure.

Regarding the performance at very low rates, such as pilot lights, refrigerators, &c., it might be pointed out that meters are tested to register at ½ cu.ft. per hour, and provided they are handled reasonably, fixed judiciously, and supplied with clean gas, they will continue so to register.

Care of Meters.

These domestic meters, which must essentially work smoothly and noiselessly, do require knowledgeable handling, and, quite apart from the precautions which you take to see that the gas they register is clean and free from detrimental impurities, there are certain other factors which need close watching and which we know are sometimes overlooked. In summarizing these they may appear elementary to many of you, but they are based on

observations from meter makers generally, and we know we are justified in emphasizing them:

(1) Meters in transit to and fro on the district should be handled carefully. If you examine the modern meter thoroughly, you will realize it is a well made instrument and worthy of respectful treatment.

(2) We find, generally speaking, that meters are not fixed in such satisfactory positions to-day as in the past, when the accepted location was usually under the stairs. Too often they are to be found near an outer door, or unfavourably positioned in the kitchen, and therefore subject to sharply varying extremes of temperature.

(3) Every step should be taken to avoid the possibility of foreign matter entering the meter. When a new meter is fixed in place of an old one it is common practice for the fitter to hammer the stopcock in order to open. This results in loosened rust particles which are carried forward in the stream of gas when the meter is put into work. The easy working of the main cock should be ensured before fixing the meter.

(4) Meters brought into stores should be immediately corked or otherwise sealed.

(5) While meters will stand occasional overload, we find in numerous cases that they are expected to cater for loads far beyond what is reasonable. Such overstraining of the mechanism is not in the best interests of the Undertaking.

(6) Periodical testing of the meters, whether *in situ* or in your works, is strongly recommended. For those of you who have no such scheme in hand, we suggest that a start be made with meters that have worked for ten years and upwards. The advantage of an "*in situ*" test is not always realized. A bench test involves disturbing the meter and may often prove misleading if great care is not taken to avoid the possibility of foreign matter reaching the gas valves, whilst the evaporation and oxidation of the light oils usually found on the valves may cause the meter to be P.U.G. on test whereas it may have been functioning perfectly on the district. Conversely, we often find that meters which have been working incorrectly in use give correct results when disconnected and transferred for bench test.

These are just a few points that we would wish to be regarded as axiomatic in every Undertaking. Cumulatively they mean a great deal to the life of the meter, and, after all, the life of meters reflects itself in your costs.

Both Mr. H. C. Smith and Mr. Currier have spoken this morning of standardization, and we do ask you, whenever possible, to take our standard productions. They have been designed by the joint efforts of your side and ours, and, as engineers, you know full well how much it helps an organization if it can confine patterns and assemblies within narrow limits.

We welcome the reviving interest in gas meters and all reputable manufacturers are themselves continuously spending money on research.

Some of you do not take advantage of all the services we offer. We will gladly arrange to instruct your fitters and to make them meter conscious, and for those who have no facilities for testing we are ready to give expert help.

The full benefit of our experience is at your disposal, and we are anxious to serve you to the utmost of our ability.

Fourpenny Gas.

Mr. T. F. C. Potterton: I am in a different position, perhaps, from the previous speakers, inasmuch as I am asking permission to refer to two sides of this question; one relates to space heating and the other to water heating. I should like to associate myself with Mr. Rogers' remarks, in the first place, and say how much Section 16 of the Society of British Gas Industries, which I have the honour to represent, appreciates the opportunity of putting before you its views to-day.

Referring to space heating, Mr. Currier starts with a very impressive statement in regard to the volume of coal used in comparison with the output of the Industry which shows the scope for activity by energetic salesmen of both the manufacturers of appliances and gas undertakings. It is refreshing to hear someone talk publicly of other considerations than the competition of electricity, which has too often been made the excuse for limited expansion in the use of gas, whereas it is one of the easier competitors to deal with, particularly in space heating.

It is true that under modern conditions there is less "home life," but this should be turned to advantage. People constantly visit restaurants and places of public amusement, practically all of which are centrally heated so that they get accustomed to these conditions. To return home to a cold house is then most undesirable, while coal fires cannot be maintained during absence in these days of limited maids, but gas is the complete answer, supplying radiant heat immediately from a gas fire or maintaining an automatically controlled temperature through a central heating system. Mr. Currier says "the conservatism of the Britisher must be remembered," but I think all we can do for British conservatism is to remember it—too often these days the public are inclined to jump at something new, thinking, too often incorrectly, that it must be an improvement on the well tried article.

With regard to the cost of appliances, I consider the present healthy competition has reduced prices to the lowest possible level with the high cost of raw material and labour, and standardization of patterns between manufacturers may lead to a higher standard charge. On the other hand, the standardizing of requirements by gas undertakings would be all to the good and must result in competitive prices on a lower plane.

A price of gas in the region of 4d. per therm is mentioned, and if we could get this as a general figure in the South of England, there would be little difficulty in obtaining business. On the other hand, it can be got at a higher price, and I am told of one London Suburban Company who, having about 90,000 consumers, have 175 central heating boilers in operation at an average price of 6·5d. per therm. The proportion of boilers to consumers may not appear high, but it is much higher than in many districts where gas is cheaper and gives some indication of the possibilities of extending this load.

Heading No. 2, "Indirect Heating Units." Mr. Currier suggests that gas fired central heating is unlikely to be installed in houses of medium size. What is implied by a "medium" size house is not quite clear, but we find considerable interest among owners of houses costing from £1,000 upwards, particularly as many such houses are run without a maid and any stoking operations, whether in open fires or boilers, have to be done by the housewife, who dislikes the job, or done before leaving for business by her male partner, who hates the job.

It is in this field that I consider there is a large scope for the development of gas fired central heating, particularly as background heating in conjunction with gas fires in the more important rooms.

It is interesting to note that the 59 domestic central heating systems in Bradford have a total output of 5,000,000 B.Th.U. per hour, or an average of 84,300 B.Th.U. each, which I consider very high. This has probably led Mr. Currier to state that medium type houses are unlikely to install gas fired systems, but from the increasing demand for smaller boilers from 30,000 B.Th.U. upwards I think many companies must find the average size of installations much lower, particularly in districts that are more residential and less industrial than Bradford.

I have made particular note of the criticism of finish and appearance of heating units, but it must be recognized that such units have to perform a heavy duty, the whole work being centralized, and a higher thermal efficiency is demanded than that given by practically any other kind of gas equipment.

Efficiency is of first importance and in this respect it may be interesting to note that with the average price of gas and average use of a central heating unit a gain of 3% in efficiency effects an annual saving in gas equal to 5% on the total cost of the heater, or a reduction equal to one farthing per therm in gas used.

Water Heating and Gas Quality.

Coming to water heating, in opening my remarks on Mr Townsend's Paper, I would first like to thank him for this valuable contribution to the Industry and for the data given, that will doubtless provide food for thought to many principals of gas undertakings when considering policy.

For Mr. Townsend's Company (and I suspect I might say for Mr. Townsend), to put out 5,539 appliances in seven years, an average of approximately 800 per year, or one per 2·45 consumers, in a district where the ordinary price of gas is 10·6d. per therm, is indeed an achievement that many undertakings might envy, particularly when one takes cognizance of the comparatively low price of electricity in the district for these same duties. His Paper is set under various headings, and I will endeavour to keep my remarks in similar order.

Under Heading 1, Mr. Townsend says it cannot be too often stressed that the ideal gas should be unvarying in quality as to calorific value, specific gravity, and air required for combustion, within narrow limits, and that its sulphur content should be low, and its inert constituents reasonably low. I take it from this that Mr. Townsend means that we on the appliance manufacturing side have not always to deal with ideal gas under ideal conditions.

He also refers to pressure, and all concerned readily agree that governors should be fitted where the service is not maintained constant; in fact, in many cases a gas governor forms a part of the equipment provided with the unit.

Concerning the standardization of calorific value, specific gravity and sulphur content of gases, it seems certain that far too little importance has, up to the present, been paid to these points. Undertakings have been visited where pressure variations on the district have been as much as from 2 in. to 12 in. W.G., and it is asking too much to expect apparatus to give its best under such conditions.

It has been stated by several engineers that since fitting governors trouble with apparatus has been reduced considerably.

Furthermore, when governors are fitted the standardization of specific gravity would greatly facilitate the setting of fittings.

Adverting to the question of sulphur content, apart from its deleterious effect upon water heaters, it seems certain that reduction of sulphur content would materially increase the period at which water heaters would need cleaning—particularly the finned types of apparatus which become choked more rapidly when the sulphur content is high; this particularly applies to flueless heaters. It also seems likely that the extra cost entailed in the removal of sulphur would be recovered in the increased periods at which cleaning is required.

Referring to paragraph 2, the reliable water heaters therein mentioned must be adjustable to the varying conditions under which they have to operate, and I think that all equipment having luminous burners, in addition to having correctly calibrated jets, should also be fitted with adjustable volume controls, permanently set by a competent person after the appliance is fixed.

Too much emphasis cannot be given to the correct fixing and adjusting of appliances. Good fitters are reasonably easy to obtain, but good supervisors, trained in the special requirements of gas-fired hot water supply, are much more valuable to gas undertakings.

Men trained under eminent heating engineers, with a full knowledge of and the capability to supervise installations of very considerable size, often make the greatest mistakes when installing gas-fired systems owing to the lack of specialized knowledge. It is here that manufacturers can assist both by accepting special men at their works for short training courses of a practical nature, or by submitting papers on their specialized subject to gas undertakings or the technical Press. The new brochure recently drawn up by the Committee, approved by the B.G.F., and of which I have some knowledge, should have an important bearing on this matter, and I look forward to the time when this publication will be available.

A Special Category.

Salesmen come under a special category, and must not be judged by the standards of ordinary salesmen who sell an article of utility, or otherwise, and get away with it. Our salesmen have to go back year after year and justify the sale. There are two mistakes a salesman can make, the first is to sell an appliance that economizes in gas by failing to fulfil the full requirement of the consumer, and therefore restrict the company's output; the other is to sell an appliance that the consumer cannot afford to use, while the good salesman is the one who keeps closest within these somewhat narrow limits.

Dealing with the question of maintenance covered by Item 5, there appears to be some diversion of opinion on the supply side as to the period of attention required. Mr. Townsend's suggestion of regular free maintenance cannot be other than recommended, and it would be very useful to the contracting side if a defined policy could be inaugurated for the various districts according to the characteristics of water, because many instances have come to knowledge of apparatus being left unattended and costly repairs involved. In addition only plant with adequate provision for easy access to every part of the interior should be selected, particularly in hard water districts, or if very high-temperature water is required.

Another point which we should like to mention concerns the particular types of apparatus supplied by gas undertakings. Too often these are restricted to the certain type or types which the particular undertaking happens to run—often regardless of the fact that this apparatus may be totally unsuited to the job in question. Some undertakings, for example, have a leaning towards instantaneous heaters, regardless of the fact that under many conditions the storage type would be more suitable and *vice versa*. I would emphasize that, where the introduction of a hot water boiler for domestic supply, or even central heating, is being considered, a careful examination of the existing system should be made.

The use of cheap solid fuel has in many cases led to carelessly designed piping systems being installed, the heat losses by radiation from exposed surfaces often being responsible for 25% to 30% of the fuel consumption.

Electrical undertakings rarely allow a hot water storage to remain unlagged even when situated in linen cupboards, and yet hundreds of gas water heaters have been fitted to systems with exposed surfaces and long runs of pipework, with obvious disadvantage.

The lagging of apparatus is now, however, receiving serious attention and in preparing specifications this item should always be included.

Does the Industry Really Care ?

Col. C. J. Falk: As Chairman of the Lighting Section of the Society of British Gas Industries I want to be the first to congratulate Mr. Clark Jackson on his excellent Paper. We are aware what Mr. Clark Jackson has done at Neath to maintain the lighting load but I would ask you seriously, has the Industry, as a whole, really got a lighting policy? Does it really care whether it retains the domestic lighting or not?

I find a great divergence of opinion up and down the country, and especially is there a marked difference in attitude between the North and the South. The argument in the South appears to be that gas is the up-to-date fuel for cooking, space heating, water heating, and central heating, but, as we cannot be experts at everything, electricity is the ideal medium for lighting; therefore, the Gas Industry should not touch anything which is not absolutely up-to-date. We see increasing evidence of gas showrooms being lit entirely by electricity. I ask you respectfully, is this the correct policy? Is not this a case of crying "stinking fish?" In the North of England this idea is looked upon with horror. Certain undertakings, and more especially in the colliery districts, rely on their lighting load to maintain their output. There is precious little cooking and certainly no heating when coal can be obtained at 5s. per ton! The members of the Lighting Section of the Society of British Gas Industries have written to me and they accuse the gas undertakings of great apathy in dealing with the lighting problem. There is no encouragement to manufacture new fittings because they allege there is no demand for them. I am well aware of all the difficulties, the three greatest being:

(1) Slum clearances—which, of course, we cannot avoid and which, in fact, are a good thing from the country's point of view. Very often, however, when new houses are built, the gas undertakings are not allowed to pipe houses for gas lighting and that difficulty you cannot get over. If you absolutely are not allowed to pipe the houses, nothing more can be said.

(2) Dirty ceilings.

(3) The great difficulty in selling gas lighting fittings to the consumer, when they already have electric fittings installed in the house, especially in conjunction with all-electric wireless sets.

To answer these points: dealing with No. 1 and No. 3 together, this is a case where salesmanship comes in. It is, of course, impossible to sell a pendant fitting if an electric fitting is already installed but surely a modern bracket could be sold and installed in each room, with the argument that electricity does fail occasionally and that it would be a good thing to have a lighting point in a living room?

With regard to Point No. 2, Dirty Ceilings, I think this is over-exaggerated because wherever you have heat you have dirt. Take any house that has central heating, and look at the walls and ceilings; they are filthy. Furthermore, in a lecture to the Sanitary Institution in London recently, a learned Professor stated that ceilings should be cleaned once a year whatever the medium of heating employed. Modern burners emit products horizontally and this helps to reduce the trouble.

We hear a lot from Chairmen of Companies that the number of their consumers is rapidly increasing but the consumption per consumer is decreasing. Surely the answer here is the loss of the domestic lighting?

When one considers the sales efforts put in to sell an article, such as a refrigerator, to even small consumers, and the great capital cost involved in purchasing apparatus like that, and the interest on the money, surely it would be easier to make a determined sales effort to get a lighting point into every room at far less cost and with far greater return?

Modern gas lighting can be switched and a neat job made of fittings, and taking the "light" consumption of an average artisan's home at 7,000 cu.ft. per annum, surely it is worth an effort to retain this? In such a home the greatest consumption is in the kitchen light and the retention of this should be secured wherever possible. In bathrooms and lavatories the use of a small gas light is a simple and efficient method of preventing the pipes being frozen.

If I may make a brief reference to factory lighting, I would say that as the result of the work of the Joint Lighting Committee on which manufacturers a few years ago were given greatly increased representation, the Industry's competitive position has been materially improved, and co-operation between manufacturers and undertakings led, for example, to the admirable display of gas street lighting at the A.P.L.E. Conference at Folkestone two years ago, the excellence of which had only to be seen to be believed. Also, under the auspices of the same Committee, following the issue in the autumn of the Home Office Departmental Committee's Report on Factory Lighting, a determined effort is being made to retain some share of this valuable load. I would urge those undertakings that are apathetic about both public and factory lighting—and it is commonly said that unfortunately there is a great deal of apathy and defeatism among gas undertakings—to give the manufacturers an opportunity of showing them what admirable equipment can be supplied for both purposes.

In conclusion, I would say that the Gas Industry reminds me of a man with a good hand at bridge, holding a high ace yet

failing to play it and, in fact, "going to bed with it." Why not let us use our trump cards, which are—

Additional warmth.

No deterioration of eyesight, and last but not least, the fact that "Gas Never Fails"!

GENERAL DISCUSSION.

Need for More Laboratories.

Mr. C. A. Masterman (Gas Light and Coke Company): Mr. Currier refers to the need for a central laboratory, but I would remind you that the primary purpose of our laboratories is to act as a link between manufacturer and consumer—a thing a central laboratory can never hope to do. I would prefer to see emphasis laid on the provision of more laboratories and more technical staff serving the same purpose as Watson House. I distrust over-emphasis on cheapness of appliances since this may defeat its own object in creating higher complaint and maintenance costs.

Two-part tariff or other concessionary price is all-important in determining whether we are discussing gas as economically competitive with solid fuel or not. If we can assume such concessionary price to become universal, the field for expansion of gas is immense. The displacement of the solid fuel fire calls, however, for entirely original thought regarding the appliances, and developments in this direction are active, but on account of seasonal load factor an expansion of room heating must be accompanied by an expansion in water heating.

We are putting a lot of effort into providing gas water heating for the millions and perhaps are ignoring the small proportion of consumers with the higher incomes whose water heating demands probably represent the bulk of the market. 1 cwt. of solid fuel per week for water heating represents several hundred therms of gas per year, and with such a load capital and installation costs, &c., can be spread so as to maintain for gas a competitive price—a position which is wrecked when the annual usage is very small. Above all, we should recognize that water heating is a complex business and remember that every installation must be dealt with individually. Mass production selling or installation methods are quite out of place, but with skill and patience the water heating load can represent an immense expansion in the use of gas to the benefit of the Industry as well as the community.

Overloading the Price of Gas.

Mr. G. M. Lewis (Birmingham Gas Department): We have been hearing a great deal about the price of gas being advanced to bear capital, maintenance, and other charges in connexion with the different appliances we have been discussing, but when you come to think that it is suggested we should give free maintenance, make no profit on the sale of the appliances, nor charge any interest on capital on the cost of gas fires, gas cookers, lighting, space heating, and everything else, surely it is time the engineer should ask whether we are not loading up the price of gas too much. It is my opinion that any fool can give something away, but it takes a sound sales policy to sell appliances at suitable prices and to keep the charge for gas at a price which will make it appeal to your public. In Birmingham some years ago—as a matter of fact in 1912—we started out with a gas fire policy and in the winter of 1912 we first let out gas fires on permanent hire. We sent out 14,000, and since that time we have installed each year approximately 10,000 gas fires. They have been put across on a proper sales basis; we have got the price of the fire, we have got the interest on our money, we have got the price of the fixing and maintenance, and we have got a good proportion of profit in our charges. That applies to both simple hire and hire-purchase. Mr. Rogers mentioned that a 7-radiant gas fire is sold for about 32s. by the manufacturers, which I know is so, and I do not think the prices of gas fires are too heavy. I certainly do not think the prices of the better types of appliances are heavy, and I do not think we are paying too much for our high-grade cookers. Since September, in Birmingham, we have taken orders for nearly 7,000 gas fires, and I suggest that it is mainly the policy of the Department and the propaganda we get over in our sales methods that has given this result. We want this business, but it must be obtained at the right price.

May I have another word about the high-grade cooker? Definitely I consider it is not expensive, but Mr. Dixon said we want a cooker for £5, and we do. We want to displace every black cooker in Birmingham. We are doing it rapidly. Nearly all our cookers now are porcelain enamelled, and if we want to concentrate on a £5 cooker to displace the black cooker, then I think the makers should get together and produce a cooker that can be standardized. That cooker should not bear the cost of advertising or overheads in the same proportion that the high-grade cooker does. The manufacturers should get these costs from the high-grade goods. I think it can be done, and I am pretty certain it will be done.

Proposed District Committees.

Major F. J. Bywater: I have been asked by the Joint Committee of the Conference to propose a very hearty vote of thanks to the readers of the Papers, and I should like also, if I may, to include our thanks to those who have contributed to the discussion. We feel sure that in this series of short Papers we have brought forward a subject which is in all our minds at the present time, but that the matter should not be left where it is at this moment. It is obvious that there are many here who would like to join in the discussion, because the subject is so important to all of us.

The Committee suggest therefore that we should adjourn and refer the matter to the National Organizations, with a request that it be sent to the Districts where these questions can be thrashed out in all their bearings, probably more effectively than even in a private meeting such as this.

As you are aware, the B.C.G.A. after nearly thirty years of useful life is now proposing to introduce some modifications in its Constitution, and it is suggested that there should now be instituted strong Committees in all the important districts, where discussions can take place on the many important matters with which the Association deals.

It has been asked what there would be for these District Committees to do, but I do not think we need ask that question after this morning. There is indeed a great deal to be done, and I do hope, speaking at this moment on behalf of the Central Executive, that you will do your utmost to make these District Committees strong and virile. Although I am in London now, I was educated and trained in this very fine city of Birmingham, and I personally have a very great respect for provincial opinion. We do want to hear the considered views of the Districts as presented by representatives appointed by them.

Col. O. B. F. Planck seconded.

Scottish Junior Gas Association

(Eastern District)

On March 11 some 40 members of the Scottish Junior Gas Association (Eastern District) visited the Newbattle Colliery of the Lothian Coal Company, Ltd. They were met at the Colliery by Mr. George Mackay and members of the staff.

The party were divided into two sections proceeding in turn round the surface workings and down the Lady Victoria Pit. The Company have their own workshops for dealing with construction, and repairs and every effort has been made to render themselves as independent as possible in this respect. The tour of the surface included the engineering, smiths', boiler, welding, and joiner and wagon repair shops, all of which are equipped with modern machinery.

After the tour the members were the guests of the Company at tea. Mr. Robert Cowie, Jun. (Hawick), President, thanked Mr. Mackay and his Staff for the very interesting afternoon and asked him to convey to his Directors their appreciation of the privilege of visiting the Colliery. Mr. Mackay briefly replied.

After tea many members proceeded to the gas-works at Newtongrange which is owned by the Company. The Works has an annual make of about 20 million cu.ft. Benzole is refined at the Works and used for transport.

Scottish Junior Gas Association

(Western District)

Some 150 members of the Scottish Junior Gas Association (Western District) visited the Govanhill Works of Messrs. Wm. Dixon, Ltd., at Glasgow, on March 11.

They were received by Mr. T. Ritchie, who conducted them to the coke oven plant, and there, by means of plans and drawings, fully explained the working of this modern Simon-Carves installation. Mr. Ritchie said that at the present rate of working 50% of the gas made at the ovens was being consumed there, the remainder being used to fire the blast furnaces at the ironworks. When the full plant was working, however, this figure of 50% was reduced to 40%, since the radiation losses were not directly proportional to the number of ovens working. Provision was also made for the firing of the ovens with blast furnace gas if ever a market was obtained for the coke oven gas.

An inspection of the plant was then made, after which the company inspected the by-product plant for the manufacture and rectification of benzole and the production of sulphate of ammonia.

After the inspection, the visitors were entertained at tea, when Mr. C. N. Sturrock (the President) thanked Mr. Ritchie and his staff for their kindness and consideration that afternoon and said what a pleasure it had been to inspect such an up-to-date plant.

A SYMPOSIUM ON

Gas Purification

Extracts from Papers presented at a recent Conjoint Meeting held in Manchester of the Manchester Section of the Society of Chemical Industry, the Chemical Engineering Group, the Institution of Chemical Engineers, the Institute of Fuel, the Coke Oven Managers' Association, the Manchester District Association of Gas Engineers, and the Manchester and District Junior Gas Association.

THYLOX PROCESS FOR THE RECOVERY OF SULPHUR FROM GASES CONTAINING HYDROGEN SULPHIDE

By G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F., M.Inst.Gas E., and ARTHUR GROUNDS, B.Sc., F.Inst.F., A.M.I.Min.E.

(*Continued from Page 742*).

The Thylox process has been for some years an established method for the purification of gas from hydrogen sulphide, but no plant has yet been erected in the British Empire. For this reason it seems desirable to preface this account of the process with the information that there are in existence to-day no fewer than 21 Thylox plants. Of these, 10 are situated in the U.S.A., 6 on the Continent, and 5 in Japan. Of the 21 plants, 4 have been increased in capacity by further extensions since they were first built. The total capacity of the plants in operation amounts to 350,000,000 cu.ft. of gas daily. Calculated in terms of coal carbonized, the gas treated in the Thylox plants is equivalent to nearly 12,000,000 tons of coal per annum; when it is remembered that the whole of the British coke oven industry and the whole of the British Gas Industry carbonize some 18,000,000 tons per annum each, the importance of the Thylox process begins to stand out in its true perspective.

Description of the Thylox Process.

The gas to be freed from hydrogen sulphide passes up the gas washer in counter-current to the Thylox solution. This solution contains some 5% of arsenic expressed as As_2O_3. The reaction which takes place in the scrubber is basically:

$$(NH_4)_3\,AsO_2S_2 + H_2S = (NH_4)_3\,AsOS_3 + H_2O.$$

This reaction is quantitative, some 98% or more of the H_2S being absorbed. At the same time, most of the cyanides are extracted and are converted into thiocyanates, while a little thiosulphate is also formed. The washing solution is kept slightly alkaline with ammonia, and since a little of this ammonia is left in the gas it is recovered in a washer placed after the Thylox washer.

The washing solution is then heated to some 45° C., a temperature at which the succeeding regeneration of the solution takes place rapidly. The warm solution is then caused to flow up a high tower accompanied by a stream of air in parallel. The main reaction in this tower is:

$$(NH_4)_3\,AsOS_3 + \tfrac{1}{2}O_2 = (NH_4)_3\,AsO_2S_2 + S.$$

The regenerated solution is used again for washing the gas. The upward current of air carries the sulphur with it in the form of a froth to the top of the tower where it forms a yellow scum which is collected in a sulphur separator. The sulphur is then dewatered on a rotary filter to give a product containing some 30-40% of water. This is then melted in the autoclave to separate the aqueous solution. In this form the sulphur contains a small amount of arsenic, and after distillation is suitable for many industrial purposes. It is often considered desirable to eliminate the arsenic down to the standard ruling for the imported product, and for this purpose a plant developed by Imperial Chemical Industries, Ltd., is used wherein molten sulphur is washed under a small pressure with fresh ammonia solution that is later returned to the process. The product, still molten, is run into the sulphur tank in order that the liquor shall be separated, and is then distilled in the usual way.

Efficiency of Extraction of the Thylox Process.

As generally operated, the Thylox process does not extract 100% of the hydrogen sulphide from coal gas.

A two-stage process has been developed in the United States of America whereby the gas after being relieved of 90% of its hydrogen sulphide in the primary scrubber passes into a secondary scrubber, where it is washed with a secondary Thylox solution which is freshly prepared, and is very active for the removal of H_2S. This secondary absorption is a batch operation with no regeneration in the cycle. The sulphur is said to be reduced by the process to less than 0·2 grain per 100 cu.ft. McBride and Edwards, of the United States Bureau of Standards, made a thorough investigation of the lead acetate paper test, and determined that discoloration of the paper took place when at least 0·3-·04 grain per 100 cu.ft. of H_2S were present in the gas. When the H_2S content was under 0·2 grain per 100 cu.ft. there was no tendency to discoloration of the paper at all. It is thus evident that the Thylox process can absorb the whole of the hydrogen sulphide down to the standard required by the Gas Industry.

The present Authors do not recommend the two-stage process, since it is found that by absorbing some 98% of the hydrogen sulphide. and practically 100% of the cyanides from the gas, the remainder of the hydrogen sulphide may be most conveniently absorbed in oxide catch boxes, which will only require attention at very rare intervals, since the gases contain no tar and no cyanides, and very little sulphur. The advantages of this method of treatment are low costs and complete certainty of operation.

For most industrial purposes, however, it is not necessary to recover more than 96-98% of the hydrogen sulphide.

Uses of Thylox Sulphur.

Sulphur is produced in the course of the Thylox process in three forms, as has already been stated in the description of the plant—namely, sulphur paste, melted sulphur, and distilled sulphur. On the Continent, the Thylox sulphur is sold in the form of distilled sulphur, this being produced as yellow blocks having an excellent appearance. In Japan and America the sulphur is generally sold as a dry sulphur paste. This paste is used in the Japanese rubber industry for vulcanization. In Japan and in America it is used as an insecticide, commanding for this purpose a considerably higher value than the distilled product. In Japan, for example, dried sulphur paste is worth 80 yen per ton, while the distilled natural sulphur only sells for 60 yen per ton. This increased value for the sulphur paste is due to the exceedingly fine state of subdivision of the particles which makes it especially suitable as an insecticide. It has been shown that the sulphur powder obtained by grinding distilled sulphur in the usual way has not the same fineness of subdivision as the sulphur produced chemically by the Thylox process. The more finely divided the sulphur, the greater is its effect on insects.

Thylox sulphur is also used in Germany for the manufacture of carbon disulphide. In Japan, while most of the sulphur is used in agriculture, a portion of the paste which is in excess of the agricultural requirements is melted and sold for the manufacture of dyestuffs. There seems no doubt that both in industry and in agriculture, a great deal of our home requirements for sulphur could be met by purifying by the Thylox process the gases, produced in coke ovens, that are used in the metallurgical industry or sold for town purposes.

It will be observed, moreover, that any of the grades of sulphur can be produced according to the state of the market. The Thylox sulphur used in Japan, America, and Germany contains a certain amount of arsenic, possibly amounting to 50 or 100 parts per million, but this is not found to be detrimental for any of the uses described. Thanks to the assistance of Imperial Chemical Industries, Ltd., as has been indi-

cated earlier in this Paper, it is possible to remove this arsenic if it should be necessary to do so.

The Economics of the Thylox Process.

The information that is available as to the cost of the Thylox process naturally emanates from America, Germany, and Japan. This information has been collected and summarized by Dr. Wilhelm Fitz.[1] As this information coincides with our own experience it has been used as the basis for this section of the Paper. The German figures have been translated into English costs on the basis of 15 marks to the pound, this being, according to our experience, the economically correct basis for converting German costs in Germany into British costs in Britain.

The earliest information available concerning the operating cost of the Thylox process seems to be contained in a book by F. Muhlert, "Der Kohlenschwefel."[2] This author gave the cost of purification as 0·53d. to 0·6d. per 1,000 cu.ft. of gas, these figures being based on an American plant using soda as alkali. There was some uncertainty at that difficult time in converting from American currency into German values.

In 1933, E. Koch,[3] in a Paper dealing with the economics of the Thylox plant at Ilseder Hütte, an early German plant also using soda as alkali, gave the cost of purification as 0·31d. per 1,000 cu.ft. of gas. Koch explained, however, that the plant was only working at 67% of its normal capacity, and he estimated that if ammonia were used as the alkali, and certain operating improvements were made, the cost of purification would be reduced to about 0·09d. per 1,000 cu.ft., thus indicating the advances that were presently to come.

In the meantime, the American process appears to have been improved, for figures given in Brennstoff-Chemie (1933, **14**, 436) (again involving the conversion of American costs into German units) for a plant using ammonia as alkali, indicated a maximum cost of 0·17d. per 1,000 cu.ft. During this year it was established in Germany, on the experience of several Thylox installations in that country, that the costs there were about 0·09d. per 1,000 cu.ft.

A. Rettenmaier,[4] on the basis of American costs at the Racine Works, deduced a figure of 0·17d. per 1,000 cu.ft., but he included in this wages and power at a somewhat high figure judged by European standards. He calculated that a similar European plant would operate at 0·086d. per 1,000 cu.ft., a statement that agrees with that of Muhlert[5] to the effect that although the price of sulphur had fallen greatly, the cost of the Thylox process had been so far reduced that it was still below 0·09d. per 1,000 cu.ft. Bähr, in a recent report,[6] has drawn attention to purification costs previously published in 1936 as being under 0·09d. per 1,000 cu.ft. of gas.

All these observations have been based on the operating results of different plants, and will thus be influenced by the local conditions at those works. A more general treatment is that provided by Dr. Fitz (*loc. cit.*). Dr. Fitz's basic figures may not in every instance be exactly those ruling in this country, but they are sufficiently close to permit of his graphs being converted directly to British figures. Our calculations show that any slight alterations in these figures made by recalculation into prices actually ruling in Great Britain are unimportant compared with the local variations in some of the basic figures in this country, especially in regard to cost of gas, power, and steam, so that Dr. Fitz's figures present a fair picture of the British cost of operating the Thylox process.

[A graph was given showing the range of operating costs for coal gas containing from 250-620 grains of hydrogen sulphide per 100 cu.ft. and with daily capacities between 15,000,000 and 56,000,000 cu.ft. of gas per day.] The operating cost of 0·09d. per 1,000 cu.ft. given in the literature refers under modern conditions only to the smallest plant with the lowest hydrogen sulphide content considered by Dr. Fitz. Many Thylox plants have been erected having a capacity of 7,000,000 cu.ft. of gas per day. The Thylox process must be limited to fairly large installations probably above 2,000,000 cu.ft. of gas per day, if it is to replace the oxide process on purely economic grounds.

The larger the plant and the greater the quantity of sulphur that is contained in the gas, and is consequently available for sale, the lower are the operating costs, until with a very large plant and a high sulphur content it is possible to have a credit balance for the operating costs.

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[4] Glückauf, 1934, **70**, 230.
[5] Chem. Fabrik, 1936, **9**, 280.
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NOTES ON THE MECHANISM OF OXIDE PURIFICATION

By H. B. AVERY, M.Sc.Tech.

In the past few years an enormous amount of research work has been carried out on the chemical operations involved in the purification of coal gas by means of oxide of iron, and a considerable number of publications dealing with this matter has recently been published.

While much of the work is of great interest, the result of the study of these chemical reactions may be said to explain and elucidate difficulties which arise owing to reactions other than the main reactions with which purification is concerned —namely, the removal of hydrogen sulphide with efficiency and economy. In the comparatively rare cases of the abnormal working of purifiers the reason and the remedy may quickly be found by means of this accumulated knowledge of secondary reactions.

The main reaction considered from a purely chemical standpoint is of a very simple nature, but further consideration indicates that the continued operation of this reaction depends more upon mechanical or physical characteristics than upon chemical ones.

The successful operation of active oxide mixtures for gas purification is generally considered to be of a catalytic nature, and it is further obvious that in order to obtain the maximum efficiency of the iron hydrates employed the primary consideration is one of contact between the crude gas and the operative material. It is, therefore, essential that as much surface as possible should be exposed to the gas. The continued activity of an oxide is, however, not fully explained by the operation of a large surface and some further function must be sought for.

It was noticed some years ago in the course of a long series of laboratory experiments that a material which had been very carefully prepared so that the maximum covering of the lightening material had been obtained (that is to say, special care had been taken to ensure that the iron hydrate had been spread in a uniform film completely covering the surface) when repeatedly exposed to the action of pure sulphuretted hydrogen and allowed to revivify thoroughly between each exposure, showed an activity after 10 exposures which was identical with its activity during the initial exposure. This result was somewhat unexpected as, when the material reached approximately 70% sulphur on the wet basis, it was to have been expected that a certain covering of the iron surface with sulphur would have taken place, thus protecting the hydrate from contact with the gas and lowering the activity of the material. It was then observed that this spent oxide, when fully revivified, exhibited externally the usual rich ferric hydrate colour. Upon grinding, however, the material assumed a much lighter shade and appeared almost sulphur yellow to the eye. The implication of this was that in some manner the iron hydrate remained on the surface of the sulphur particles and was not heterogeneously mixed with the sulphur deposited at this stage. It was considered advisable to continue the examination of spent oxide microscopically in order to confirm this observation and a number of oxides were prepared from materials of somewhat different activities and with varying lightening materials and exposed under laboratory conditions to pure H_2S, allowing complete revivification between each exposure, ten exposures being given as the minimum.

Microscopic slides were prepared and colour photographs of the sections made on Dufay film.

It should be emphasized that pure H_2S was used in order

to avoid the complication arising from the tar and Prussian blue found in normal spent oxides; the incidence of these materials considerably interfered with the clear division of the layers shown in the specimens prepared in the laboratory.

In general this peculiar migration of the iron to the surface of the particle undoubtedly explains the continued activity of a carefully prepared oxide.

The sections showed clearly an outer layer of ferric hydrate and an inner layer of sulphur, crystalline in structure, supported on and closely adhering to the core of lightening material.

From the appearance of the sulphur forming the inner layer it might be assumed that it had been subjected to a sufficiently high temperature to cause fusion and subsequent crystallization and it is interesting to note in this connexion that the general temperature, as recorded in the body of an oxide in operation, is not by any means a measure of the maximum temperatures reached locally during the reaction. It has been observed that when operating oxide for the removal of H_2S with revivification *in situ* where the body of the oxide never reached a temperature of more than 75° F. actual ignition of the gas mixture, when a high oxygen content was present, took place. The minimum ignition temperature of H_2S and air is 570° F., thus it is possible to conceive that in the normal working of the boxes at temperatures below those frequently found of 80-90° F. local temperatures sufficient to fuse the sulphur may be reached.

It is somewhat premature to make any dogmatic statement with regard to the manner in which this action takes place, but there is certainly a field for interesting speculation, and any suggestions offering an explanation of this phenomenon would be welcomed.

The Newcastle Coal Prices Enquiry

The Central Appeal Tribunal set up under the Coal Mines Act, 1930, as amended by the Coal Act, 1938, continued its hearing on Saturday last of the appeal by the Newcastle-on-Tyne and Gateshead Gas Company against the recent decision by the Durham District Committee of Investigation concerning the 1939 contract prices for Durham unscreened coal.

(The two previous hearings of the Tribunal in London were reported in the "JOURNAL" for March 8, p. 671, and March 15, p. 728.)

Mr. *Thomas Hornsby* (Chairman of the Durham Sales Control Committee) continued his evidence for the respondents, and said there had been no discrimination between any of the 42 buyers of rail-borne gas coal in the Durham area. The Committee endeavoured to obtain the full price from all gas companies, both inside and outside the Durham area, but was not always able to secure the full price asked from buyers of gas coal outside the district.

In 1935, the London Gas Companies had obtained the largest part of their coal from Durham, and had bought other quantities from the Midland Amalgamated District (M.A.D.) and from Northumberland. In 1935 they had made contracts covering the years 1936, 1937, and 1938. But early in 1937, owing to the very heavy demand for coal, they had become rather nervous that they might not get the whole of the quantity of coal they needed for 1937 and 1938, and had agreed to buy supplementary quantities at a price which was 4s. 3d. per ton above the 1935 minimum price. Further, having previously arranged to make an extra payment of 1s. per ton in respect of miners' wages up to June, 1937, they had agreed to continue to pay that extra 1s. until the completion of the old contracts. The Newcastle Company had also agreed to continue to pay the voluntary 1s. per ton.

Discussing the negotiations with the London Companies for coal to be delivered in 1939, he said that in April, 1938, the Committee was approached by a representative of one of the largest of them; and it had learned also that the M.A.D. were in negotiations with the same Company. Naturally, the Durham Sales Committee had exchanged opinions with the M.A.D., and it was ascertained that the M.A.D. were asking for a delivered price representing an increase of 5s. 5d. per ton over the price paid in 1935. It was concluded that Durham would be well advised to follow suit, and therefore, the Durham Sales Committee had asked for a similar increase in delivered prices. But the prices had to be quoted f.o.b. It was known that freight charges to London would be increased by about 1s. per ton in 1939 as compared with 1935, and it was believed also that discharge costs would be increased by about 2d. per ton. Therefore, deducting the 1s. 2d. from the 5s. 5d., the Committee had arrived at 4s. 3d. per ton increase in f.o.b. price for 1939 over 1935 prices, which meant an increase of 5s. 5d. per ton in the price of coal delivered to the works in London. But the M.A.D. could not obtain the full increase of 5s. 5d. in the delivered price from the London Company concerned, and after discussions between the Durham and the M.A.D. Committees, it was agreed that the M.A.D. should reduce its price by 6d. per ton. The Durham Committee had also reduced the prices of some coals by 6d., others by 4d., and some of the lower class coals by 3d. Thus, the f.o.b. price quoted to the London Companies by the Durham Committee was reduced to represent an increase of 4s. (instead of 4s. 3d.) above the 1935 price; that meant an increase in the delivered price of approximately 5s. 2d. above the 1935 price.

Asked if, as the result of the negotiations, the Durham Committee had secured as good orders from the London Companies for 1939 as was the case previously, he said the Committee had done very well. The Companies had bought 3,657,000 tons; but there were arrears of about 1½ million tons under the old contracts, so that the quantity for 1939 would be about the usual 5 million tons. He was satisfied that, if a reduction had not been made, there was risk of losing part of the orders; indeed, a certain proportion of the amount usually taken from Durham had been lost, and the quantity from the M.A.D. had been increased.

The negotiations in April, 1938, had been regarded as fixing the general level of prices. The negotiations with the large London Companies were not completed until the beginning of July.

Dealing with the negotiations with Mr. T. P. Ridley, witness said Mr. Ridley had heard that the London Companies were to pay 4s. more than in 1935, and he had offered to pay a similar increase, although it was more than he had hoped to pay. But he was informed that the Sales Committee were not prepared to accept the 4s., but asked for an increase of 5s. That would have yielded a pithead price of 18s. 6d. per ton, after deducting cost of delivery from pit to works. He had written to Mr. Ridley to the effect that, in the view of the Sales Committee, rail-borne coal prices were much too low in the first instance, and that an increase of 5s. over the 1935 basis price was fair and reasonable.

Although the delivered price of the local rail-borne coal was higher than the f.o.b. price for coastwise coal, the delivered price of the latter coal in London was higher than the delivered price to the Newcastle Company; and other industrial consumers were being charged a higher price for rail-borne coal (not gas coal). He was not trying to obtain from the Newcastle Company a higher price because he had thought that it was bound to buy the coal in Durham in any event. The Sales Committee had made up their minds, early in the spring of 1938, that they would try their utmost to obtain an increase of 5s. per ton at pit for all the coal, whether rail-borne, coastwise, or export. He produced a statement of prices agreed for 1939 deliveries of class B coal for other than gas purposes, to inland purchasers, showing the average increase in prices as 5s. 6d. per ton. That was a weighted average. Another statement relating to coastwise coal (again excluding gas coal) showed an increase of just over 5s. per ton in pithead prices.

The average proceeds to the collieries in Durham in 1935 were 12s. 8d. per ton, and the price paid by the Newcastle Company in that year represented 13s. 6d. pithead—a difference of 10d. The agreed wages to the miners amounted to 70% above their basis rates to-day, and in order to pay that, the proceeds required were 17s. 8d. per ton; that was again 10d. per ton below the pithead price of 18s. 6d. which the Newcastle Company was asked to pay in 1939.

The total sale to London Gas Companies gave a pithead price of 18s. 1d. If an average of 18s. 1d. could be obtained for all Durham coals the Committee would be well content.

Mr. J. H. THORPE, K.C., cross-examining on behalf of the Newcastle Gas Company, said that, whereas the cost of delivery of Durham coal to the Company averaged 2s. per ton, the cost of delivery of Yorkshire coal was 10s. per ton. Thus, there was a difference of 8s. The Durham Committee could increase the price to the Company by 7s. 11d. before the Company might be compelled to buy in Yorkshire. He asked at what point it was

considered that an increase in Durham coal prices would become unfair.

Mr. *Hornsby* replied that that depended entirely on the facts. It might become unfair.

Mr. THORPE referred to the report of the Board of Trade on the working of the schemes under the Coal Mines Act, presented in June, 1938, in which reference was made to the protection of consumers against possible exploitation. He asked if Mr. Hornsby would consider it unfair to discriminate.

Mr. *Hornsby* replied that the Durham Sales Committee had not discriminated. It was following the practice adopted by every other district in the country; the consumer in the district had to pay a higher price than the consumer further away.

Asked how he justified that proposition, he said that the London Gas Companies, for example, were not in competition at all with the Newcastle Company, either in the sale of gas or the sale of residuals, and the delivered price to them was shillings higher than the delivered price to the Newcastle Company. Mr. Ridley had admitted that the delivered price was of paramount importance to the gas coal consumer. The Newcastle Company derived benefit from its geographical position, and it did not hurt the Company if it did not get the full benefit.

Mr. THORPE said that the Sales Committee was using its powers to secure a higher pithead price from the Newcastle Company than from the London Companies.

Mr. *Hornsby* agreed that the pithead price was higher, but not the delivered price; and the Committee was bound to have regard to the delivered price, to see that the buyer did not suffer. The primary job of the Committee was to bring more money into the coal industry; but it did have regard to the consumer, to ensure that the prices charged were not unreasonable or unfair.

COUNSEL put the point that coastwise and rail-borne trade had previously been treated in the same way for the purpose of prices; there had always been an average difference of 1s. 9d. between the f.o.b. prices quoted for coastwise coal and the pithead price of rail-borne coal. He urged that surely the price which concerned the collieries was the pithead price.

Witness replied that the f.o.b. price had been fixed, and when working back to pithead price the freight charge from pit to boat happened to work out to 1s. 9d. The endeavour was to get as high an f.o.b. price as possible, in order to obtain a pithead price as high as possible.

The CHAIRMAN (Mr. J. Norman Daynes, K.C.) asked if it was not necessary to consider both the pithead price and the cost of freight to the boat in arriving at the f.o.b. price.

Mr. *Hornsby* said that the Committee had a general idea of the average freight from the pit to the boat. But the Committee had not dealt with it on that basis; it had been guided by what it could get, in competition with other districts.

Mr. THORPE suggested that as regards coastwise coal the Committee obtained what it could, and as regards rail-borne coal, at any rate in Durham, it obtained what it liked to charge, subject to appeal.

Mr. *Hornsby* replied that that was partly true. The difficulty was that, of the 22 million tons sold annually from Durham, 18½ millions were shipped, and only 3½ millions were supplied to consumers within the district.

In the course of further cross-examination, Mr. Thorpe asked if Mr. Hornsby would ever be satisfied. He replied that when he could secure prices to yield proceeds giving the miners 89% above the basic wage, as against the present 70% above the basic wage, he would begin to be satisfied.

When it was suggested that, if co-ordination with other coalfields in the selling of coastwise coal continued, and there were further reductions in f.o.b. prices, the only means of recoupment by the Committee would be by increasing charges to buyers such as the Newcastle Gas Company, who had not the sweet benefits of co-ordination, he said he would not go so far as that. Co-ordination was in its infancy, and in time it would probably become 100% foolproof.

Re-examined, witness said that he had not charged more to the Newcastle Company than to other gas companies in the area, for the same class of coal; the 5s. per ton was a general overall increase.

The evidence on behalf of the respondents was concluded.

The Case for the Miners.

Mr. *J. E. Swan* (Secretary of the Durham County Mining Federation Board and General Secretary of the Durham Miners' Association), putting forward his case on behalf of the Durham miners, said that when the selling schemes had come into operation in the coal industry it had been considered that there would have been a substantial change in the wages of the Durham miners. He referred to the various reductions of wages which the miners had suffered from time to time, and said that there was competition between pit and pit and between district and district, selling prices were at rock bottom, companies were going into liquidation, thousands of men were being thrown out of work, and wages were at rock bottom; and the miners had decided to end the then existing wage agreement. There had been reduction of wages, first from 110 to 89% above basic wage, and secondly to 65%. There were negotiations, but, in order to give the selling schemes a chance, a provisional increase from 65 to 70% above basic wages was accepted; and it had been a formidable task to persuade the men to accept it.

They had had to complain seriously against the Sales Committee for not having done more to raise the Durham miners' wages to something like the level of the average wages of the miners in Great Britain, and to raise the level of coal selling prices in the County of Durham to something like the average level of the prices in Great Britain generally. He produced statistics to show that, whereas the average number of shifts worked by miners throughout Great Britain was 270 per annum, the Durham miners worked 275; and whereas the average income of miners throughout Great Britain was £149 10s. 1d., the average income of Durham miners was £140 9s. 1d. per annum, after giving credit for coal and other means of payment in kind. They believed the schemes were set up principally to benefit the miners, by improving the finances of the industry. But now it seemed that they had to wait for the resurrection before the scheme fructified and before wages could be increased beyond the 70% above basic wages.

Asked by the Chairman if he considered the Sales Committee was wrong in reducing the price to the London Gas Companies, he urged that, until the Sales Committee had fulfilled its function and carried out the pledge to the miners to improve wages, it had no right to reduce the selling price to any buyers.

The CHAIRMAN said he did not think anybody disputed that unrestricted competition would make things worse for the miners. But the competition was not unrestricted, for there was a scheme to control the sale of the coal. He asked whether, if the Committee had not reduced its prices to the London Companies, it might have lost a good market, and therefore would have had to increase prices to other customers in order to maintain wages, with a risk of losing further customers.

Mr. *Swan* said it appeared that by getting a move on with regard to co-ordination among the various districts it should be possible to lift prices to a higher level.

The question was raised that the increase of 1s. per ton to the Newcastle Company would mean an extra cost to the Company of £11,000 odd per annum, and what effect that would have upon the miners' wages. Mr. THORPE said he was informed that it had been calculated as 2s. 1d. per man per annum. Mr. Swan added that the miners objected to any reduction of prices, because concessions in one direction might lead to concessions in others, to the detriment of the chances of procuring better wages.

The CHAIRMAN expressed sympathy with the point that it would be much better if the miners could be paid higher wages. But the Tribunal had to consider the question of the difference in price as between the Newcastle Company and the London Companies.

Mr. *William Hall* (President of the Durham County Mining Federation Board and Secretary of the Durham County Mechanics' Association) gave evidence in support, in the course of which he gave particulars of wages paid to engineers, stokers, and others doing comparable work in the coal industry and in the gas and other industries in Durham, showing that the former were paid the lower rates.

The Tribunal adjourned until Monday, March 20, when Counsel delivered their final addresses.

The enquiry was concluded on Monday, March 20, when Counsel for both parties addressed the Tribunal.

Mr. EVERSHED, on behalf of the Executive Board of the Durham (Coal Mines) Scheme, 1930, said it had been agreed by Mr. Ridley, when he gave evidence for the Newcastle-on-Tyne and Gateshead Gas Company, that there had been no discrimination as between rail-borne customers, so that this was not a case in which it was a question of a special price to a particular individual taking coal in precisely similar circumstances. On the other hand, Mr. Ridley had complained that another undertaking in the same Industry as he was engaged was obtaining coal more cheaply, and he had agreed that this was a business transaction in which he was trying to get the best price he could. Therefore, on the facts, there was no substantial difference of opinion between the parties.

The CHAIRMAN: When all is said and done, Mr. Hornsby is trying to get as much as he can for the coal trade and Mr. Ridley is trying to get as much as he can for the Gas Industry.

Mr. EVERSHED said the whole point was that the Government had said the prices of coal must be raised in order to provide the 70% on the miners' basic wage and if that were done it meant that an additional £1,000,000 would be spent by the Durham miners, and that must be borne in mind. So far as it was suggested that he proposed increase in the price of coal was not in the public interest, Mr. Evershed suggested there was no argument that could be put forward, and so far as he could see no such argument had been put forward. A suggestion had been made at one time as to large dividends being paid by the colliery

owners, but there had been no evidence of that, and he did not propose to pursue that point either.

He therefore came to the question whether the act of the Sales Committee in fixing the price to the Newcastle Gas Company was unfair or inequitable. He said he gathered that this meant there was something unfair or inequitable as between the vendor and purchaser—*i.e.*, as between the coal trade and the Gas Industry. In his view, for that argument to succeed it must be shown that there was more than that the bargain made between two parties was less beneficial to one party than that party would have liked, and he took it that the argument in this case carried with it the suggestion of some degree of moral turpitude on the part of the person responsible for fixing the price. He submitted that nothing of the kind had been proved in this case, and in the circumstances of this appeal he urged that something more than mere hardship must be established. He came back to the point that Parliament had said coal prices must be raised, and it was not sufficient to say that the price fixed was unfair or inequitable because it operated a little hardly on somebody. He did not know that the matter could be put with greater precision and he doubted whether the Tribunal would be anxious to formulate anything very precise for guidance in the future.

The CHAIRMAN: I think it would be rather dangerous to do that.

Mr. EVERSHED said it must be shown that there was some substantial disadvantage, and the case could not rest on the mere proposition that what had been done was unfair or inequitable. Mr. Hornsby had started with the object of getting an increase of 5s. per ton over the 1935 summer prices; and if he could not get it from one quarter he must get it from another.

Mr. J. H. THORPE, for the Newcastle Gas Company, submitted that a wrong procedure had been adopted in fixing the price and, in his view, it amounted to a discrimination which was not justified by the Act. He contended that it was material to the Tribunal to know how the price was arrived at and the circumstances which were taken into account.

Mr. EVERSHED replied that in his view there was nothing in the Selling Scheme to prevent the Durham Committee granting special permits for the sale of different classes of coal for different purposes, and he also submitted there was nothing in the Selling Scheme to prevent the Sales Committee from granting special permits for the same classes of coal at different prices; whether that was to be regarded as fair and equitable was another matter.

Continuing, he said there had been a considerable amount of discussion about f.o.b. prices and that these meant that the pit prices were necessarily the same as when f.o.b. prices were not involved. In his view that was a complete fallacy, and in any case, when looking at these Selling Schemes he submitted there must necessarily be differentiation between those burning the same class of coal. Indeed, he went farther and submitted that it was required by the Scheme in this case that sea-borne coal should be treated in a different classification from rail-borne coal and it would not be incorrect for the Sales Committee to say that the coal supplied to the London companies was in a different category from the coal supplied to the Newcastle Gas Company. There was nothing which said the price should be the same. In any case, the correctness of the allegation of the Newcastle Company depended upon whether there was the necessity to raise the price of coal by 5s. over the 1935 summer prices in order to secure the amount necessary to pay the miners their 70% over the basic wage, and on the figures put in by Mr. Hornsby he submitted the case for the Sales Committee was conclusive on that point. That being so, it only remained to see whether the price which had been fixed was unfair or inequitable in the differentiation. The whole test was whether the Newcastle Company was affected by the price in relation to other similar people in the same area, and it was admitted it was not. Moreover, it was the fact that when the coal reached London the gas companies there had to pay several shillings per ton more than would the Newcastle Company for its delivered coal, notwithstanding the additional 1s. per ton pithead price. Thus the Newcastle Company still had a substantial geographical advantage and it could not be said to be at a disadvantage *vis-à-vis* the London companies with whom it was not in competition in any way. Moreover, the Newcastle Company had substantial reserves and even if the whole of the extra cost of coal was borne by the shareholders it would not represent a very considerable amount. Somebody had to bear it, and he regarded it as very doubtful whether the Gas Company would put up its prices on account of the proposed increase in the cost of coal. It had been said that there was competition with oil, but the London gas companies with very much higher costs than Newcastle, had to meet competition from oil, and they seemed to survive.

Even if the Tribunal came to the conclusion that the Newcastle Gas Company would suffer any disadvantage, Mr. Evershed said he hoped a benevolent view would be taken of the Act, and unless it could be shown that substantial injustice would be done, care should be taken in arriving at a decision not to wreck the very object which Parliament had in view. He therefore asked the Tribunal to confirm the decision of the Investigation Committee and to say that the price which had been fixed was neither unfair nor inequitable.

At the conclusion of Mr. Evershed's remarks,

The CHAIRMAN asked if Counsel had considered the question of costs. He said there were several points to be considered in that connexion in this particular case. In the first place, this appeal would affect a number of undertakings, and it also seemed to the Tribunal that this was a matter which should be investigated as fully as possible.

Mr. EVERSHED said that this appeal was being taken with the assistance of the National Gas Council, and this in itself suggested that the appellants should bear the costs if they failed, as would be the case in the ordinary course of things, the same remark, of course, applying to the Committee of Investigation if the appeal went the other way.

The CHAIRMAN said his own view was that there might be good grounds in this case for giving no direction as to costs.

Mr. EVERSHED, after consulting those instructing him, said he was willing to leave the matter in the hands of the Tribunal, and did not wish to enter into any further argument with regard to this matter.

The CHAIRMAN added that if this case had been brought frivolously the Tribunal would have had no hesitation in expressing its view by giving a direction as to costs.

Mr. J. H. THORPE, making the concluding speech, reminded the Tribunal that short of an amendment of the Act of Parliament, an Appeal of this nature was the only means the Gas Company had of endeavouring to obtain redress, and he knew that was a consideration which the Tribunal would not disregard. Continuing, he suggested it was unnecessary for the purposes of this case to lay down a hard and fast rule as to what was fair or unfair, and it had been admitted by Mr. Evershed that in the cases he had quoted where this matter had been dealt with in judgments, the circumstances were entirely different. Indeed, Mr. Evershed, in mentioning these cases, had admitted that they did not help very much, but that he quoted them for what they were worth. For instance, in none of the cases quoted had the element of compulsion come in, whereas in this case the two protagonists consisted of one which had statutory powers and restrictions and another which had powers which enabled it to do pretty well what it liked, and it was complained that in this case the second body was making full use of its monopoly powers.

Continuing, Mr. Thorpe said he, on his part, wished to stress the question of public interest very strongly. The object of Mr. Hornsby was to get as much money as he could into the coal trade, but there were many other interests than merely that of the coal trade. That the miners should get a specified wage was only one consideration. There was the consideration as to whether Durham should hold the London market or whether it should go to the Midlands, and there was the consideration of the interest of the domestic and industrial users of gas, and his contention was that the price of 18s. 6d. per ton at the pit for B Class coal was too high in the public interest.

Referring to the geographical position of Newcastle, Mr. Thorpe said the Gas Company's basic price was based by Parliament on the fact, among other things, that it was close to the coalfields and could get coal cheaply. Hence the basic price was very much lower than that fixed for the London gas companies—viz., 7·2d. per therm as against 11d. per therm—and it was assumed that the Newcastle Company would sell cheaper gas. It could be said that an application could be made to the Board of Trade for an increase in the basic price if the price of coal went up, but an increase in the price to the consumer would immediately have the effect of causing consumption to go down. The Company must supply cheap gas and was penalized under its basic price if it did not. There was also the question of competition with raw coal, and he referred to the Report of the Royal Commission on the Coal Industry in 1925, which called attention to the waste involved in burning raw coal and the danger to health and property, yet the action of the Durham Sales Committee would tend to cause more raw coal to be burned and less gas.

In the course of further comments, Mr. Thorpe referred to discrimination on the part of the Sales Committee and pointed out how the Gas Industry was bound by Statute to treat alike all those who took gas under similar conditions. He contended that in no circumstances was the differentiation proposed justified. If, however, the Tribunal took the view that the discrimination complained of was not unfair within the meaning of the Scheme he hoped they would give some indication for the discretion of others as to how all these Selling Schemes should work in this connexion, in the public interest.

The CHAIRMAN: Supposing we were to decide in this case that the Central Board had acted properly, it would follow from that that they might start off by giving a differential price.

Mr. THORPE said a great deal would turn on whether the Tribunal accepted his interpretation of the clauses on this point or the interpretation placed on them by the other side.

The Enquiry then closed, and the Chairman announced that the Tribunal would give its decision on Monday, March 27.

Gas Undertakings' Results

Brisbane (Queensland).

The accounts of the Brisbane (Queensland) Gas Company are made up half-yearly, and the report of the Directors which accompanies those for the six months to Dec. 31 states that the sales of gas and of appliances show a good increase over the corresponding half-year of 1937. There has also been a very satisfactory increase in the number of consumers. The return from residuals suffered, owing to the use of inferior and old-stock coal. The make of gas per ton was also materially affected by this inferior coal. Owing, however, to their large reserve stocks of coal, the Company were able to maintain a continuous supply of gas throughout the coal strike. The net amount to credit of profit and loss for the half-year (including the balance brought forward) is sufficient to permit the payment of a dividend of 3½% and slightly to increase the carry-forward. During the coal strike the Company experimented with hardwoods growing around the Greater Brisbane area, and found certain timbers that would produce a greater number of cubic feet of gas per ton of wood than they were obtaining from the coal supplied them; and although the calorific quality of the gas is below that required by the Gas Act, this deficiency can be made up by gasifying a proportion of mineral fuel oil. The Company carbonized just over 100 tons of the wood, and the charcoal by-product sold readily at £2 per ton, as against an average price of £1 0s. 10d. per ton for coke produced from their coal.

Cleveland.

The Cleveland Gas Company (whose offices are at Skinningrove, Saltburn, Yorks.) in the last half of 1938 sold 13,978,800 cu.ft. of gas, as compared with 15,210,600 cu.ft. in the corresponding six months of the previous year. Returns from residuals have also been less, and in the result the balance carried to Profit and Loss Account is £472, as against £891 a year ago. For the half-year to December, 1937, a dividend was paid at the rate of 2½% per annum. On the present occasion the sum of £266 is placed to reserve for repairs to plant, but the Directors do not recommend the payment of a dividend—the balance of £3,076 being carried forward.

Dover.

The quantity of gas sold by the Dover Gas Company during last year was practically the same as in the preceding twelve months. The actual figures are: 1938, 1,792,421 therms; 1937, 1,792,822 therms. The receipts on Revenue Account are about £3,200 up, while the expenditure has been some £4,000 more. Thus the balance carried to Net Revenue Account is £10,430, as compared with £11,137 a year ago. At the foot of the Revenue Account appears the statement that the item debited for coals includes £1,832 paid to contractors for Town Coal Dues charged by the Corporation of Dover—that is, 1s. 7d. per ton, the equivalent of 1·2d. per 1,000 cu.ft. of gas sold. The dividend for the year on the ordinary stock and shares is 8½%, which will leave £3,323 to be carried forward to the credit of the current year. Last year the dividend was the same, but the carry-forward was £9,044. During the past twelve months there has been a net increase in capital expenditure of about £14,000—£13,656 having been in connexion with new works. This leaves the Capital Account in debit to the small extent of £6,547.

Dublin.

The accounts of the Alliance and Dublin Consumers' Gas Company for the half-year to December last show sales of gas amounting to 6,738,833 therms, which compares with a total of 6,711,929 therms in the corresponding half-year of 1937. Alterations in the Revenue Account figures include the disappearance from the receipts side of an item which figured at over £5,000 a year ago—profit on sales of gas fittings—and on the expenditure side reductions of about £30,000 in manufacturing costs, and £6,000 in distribution charges. On the other hand, rates and taxes are some £5,000 up. The result is a balance carried to Profit and Loss Account amounting to £77,847, which compares with £50,010 for the December half-year of 1937. During the past six months there has been a net addition to capital expenditure of some £18,000, which brings the debit balance on Capital Account to £147,836. The dividend on the consolidated ordinary stock is at the rate of 8% per annum, with a carry-forward of £16,788.

Hastings and St. Leonards.

The total quantity of gas sold during 1938 by the Hastings and St. Leonards Gas Company was 2,807,061 therms, which compares with 2,814,786 therms in the preceding twelve months. While the receipts are some £800 up, at £168,787, the expenditure on Revenue Account is more by some £2,000, so that the balance carried to Net Revenue Account is about £1,200 less, at £27,076. The dividends for the year are 7% on the 5% converted stock, 5½% on the 3½% converted stock, and £6 8s.% on the 5% additional stock, which will leave £5,086 to be carried forward to the credit of the current year. A year ago the carry-forward was £5,340. In their report, the Directors state that it unfortunately became necessary, mainly owing to the price of coal, to give notice of an increase, as from the Christmas readings of the meters, of 0·4d. per therm (1·84d. per 1,000 cu.ft.) in the price of gas. A net addition during the year of about £5,000 to capital expenditure brings the Capital Account debit balance up to £18,000.

Londonderry.

Sales of gas by the Londonderry Gas Light Company were somewhat less in the past twelve months than they were in the preceding year. The actual figures were: 1938, 174,953,600 cu.ft.; 1937, 181,398,000 cu.ft. This is exclusive of the public lighting, which is entered at £698 (including wages paid) for each of the two years. It is the Board's intention to augment during the coming summer the production side of the works by the installation of some of the most modern retorts, for which purpose provision has already been made in the Renewals Suspense Account during recent years. The gross revenue for the past year amounted to £56,536, which is £573 less than that for 1937. On the other side the expenditure was £438 less. The payment of dividends for the year of 10% on the old shares and 7% on the new shares will leave the sum of £13,740 to be carried forward. A sum of £4,000 has been charged in the Revenue Account for the purpose of meeting future cost of renewals.

Maryborough (Queensland).

The Maryborough (Queensland) Gas and Coke Company, Ltd., make up their accounts half-yearly, and in presenting those for the six months to Dec. 31 last the Directors state that the sales of gas and residual products show an increase as compared with the corresponding period of 1937. Actually the net proceeds from sales of gas in the past six months were £4,985, as against £4,822 in the latter half of 1937, while the returns from residuals are £100 up, at £706. After writing off £400 for depreciation, the amount at credit of Profit and Loss Account (including a balance of £176 brought forward from the previous half-year) is £1,549, out of which the Directors recommend the payment of a dividend at the rate of 5% per annum, which will leave a balance of £518. Taxation assessments totalling £451, to be paid during the present half-year, are provided for in this amount, which leaves a balance of £67 to be carried forward.

Timaru (N.Z.).

Although the past year has been a difficult one, owing to rising costs, the Directors of the Timaru (New Zealand) Gas, Coal, and Coke Company, Ltd., found themselves in a position to recommend that a dividend of 4% be paid to the shareholders. This will absorb £1,560, and leave a few pounds to be carried forward. The Directors, in submitting the sixty-fourth annual report and balance-sheet, for the year 1938, remark that further increases in wages under awards of the Arbitration Court, brought into effect during the year, have created fresh difficulties in carrying on the Company's operations, and it is only by the exercise of rigid economy in expenditure that they have been able to produce as favourable a result as is shown in the Balance-Sheet. Owing to the fact that a number of the consumers were using only very small quantities of gas, and that a consumption of less than 600 cu.ft. per month means a direct loss to the Company, it was decided as from April last to adopt a minimum charge of 2s. 6d. per month. The number of consumers who applied to be disconnected was much smaller than expected, and of these a considerable proportion have since applied to the Company for re-connexion. The dividend of 4% now declared compares with 2½% paid for the previous year.

Wellington (N.Z.).

After the payment of a dividend of 8% for the past year, the Wellington Gas Company, Ltd., of New Zealand, will carry forward a balance of £19,547 to the current account, as compared with £18,854 a year ago. The gas consumption of the past year shows an increase of 110 million cu.ft. compared with five years ago, and in the same period the Company have obtained 5,420 new consumers, and installed 20,803 gas-consuming appliances. Negotiations are now in progress to provide an exhibit worthy of the Gas Industry at the New Zealand Centennial Exhibition (which is to be opened at Wellington next November). The revenue of the Company for the past twelve months is £8,185 greater than that of the previous year, but this has been more than absorbed by the increased cost of coal, materials, wages, and taxation. To provide for the increased demand for gas, further plant has been installed, including duplicate units of exhausting apparatus.

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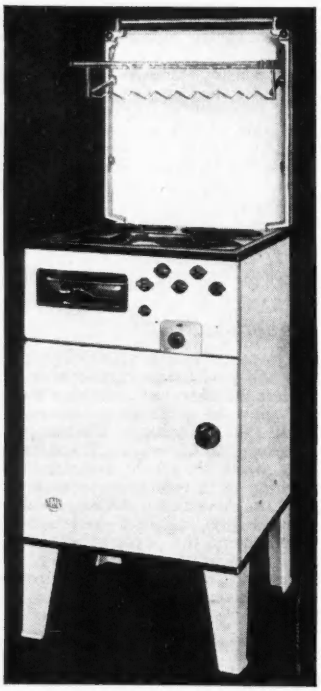
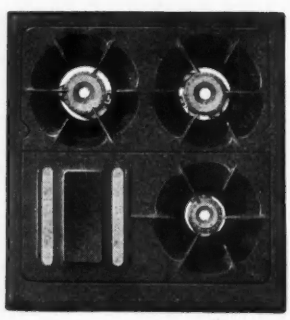


The No. 57 Cooker with Hinged Cover (open), Incorporating Chromium Plate Rack. Other alternatives are the standard Chromium Single Plate Rack with Back-Plate, or the Small-Pattern Back-Plate or the "P.R." Hot-Closet.



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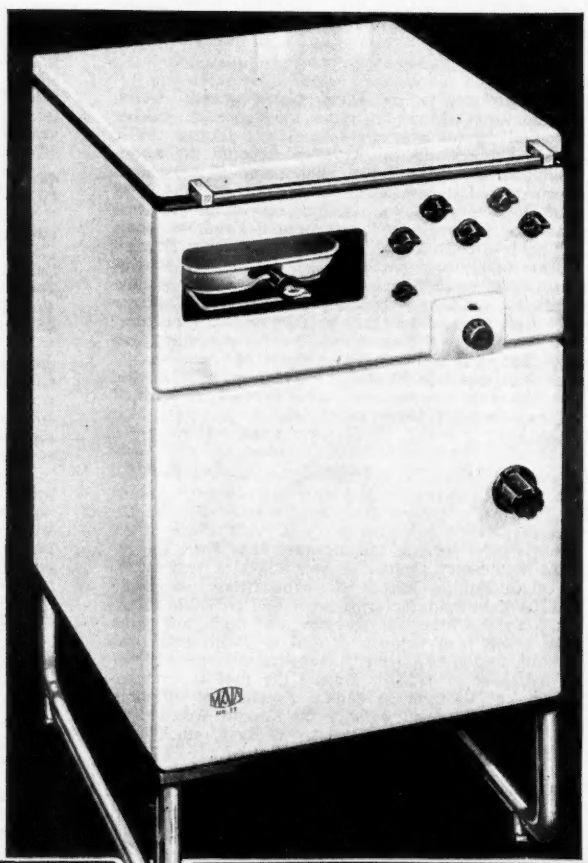

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Dangerous Swelling Pressures in Carbonization Practice

By
G. E. FOXWELL, D.Sc.(Lond.), F.Inst.F., F.Inst.P., M.Inst.Gas E.

From a Paper at a Joint Meeting of the Institute of Fuel and the Coke Oven Managers' Association (Northern Section), Newcastle, March 16.

It is not altogether certain when it first became realized that during carbonization coals could exert pressures detrimental to the stability of the brickwork. Probably the true cause of some of the failures of early coke ovens was not recognized in those days, but with the increased flue temperatures adopted in coking practice with the advent of silica bricks the dangerous character of certain coals became recognized, especially in Germany, where several instances of serious damage focused attention upon the swelling characteristics of the coals used for coking.

In the interior of the plastic layer the gases may escape only slowly or not at all, even when the pressures become very high. This is a much more important cause of internal swelling pressure. It will be evident that both the internal pressure between the layers and the internal pressure within the layers act laterally and normal to the oven wall, and if the plastic properties of the coal cause the sum of these pressures to become sufficiently high, the brickwork may be damaged.

A still more important point is that the two vertical plastic layers will meet in the centre of the charge. At this period the chances of a high internal pressure are increased. At the actual moment of meeting and for a few minutes thereafter, the central zone of the charge is receiving heat from both sides simultaneously while the coal is being raised in temperature through the plastic range. The result is an important acceleration in the rate of rise of temperature, and this in turn, as the Author's experiments* have shown, gives rise to a much higher plasticity so that there occurs simultaneously a more rapid evolution of gas with a greater resistance to its escape. There is thus the possibility that even if no unusual pressure is exerted on the walls of the ovens during most of the carbonizing period, an intense local pressure may result for a few minutes when the plastic layers coalesce. Measurements have shown that this occurs, and that it may be a source of considerable danger.

Koppers and Jenkner† set out to determine the safe pressure that could be applied to a coke oven wall. For this purpose a wall 4·5 m. high and 2 m. long was constructed of normal coke oven shapes and was loaded from the top to correspond to the weight of the brick superstructure. The lateral pressure load was provided by a hydraulic press, which transferred the pressure first to a wall of planks and then (to ensure uniform distribution) through a layer of pearl coke, and so to the oven wall. The experiment was also carried out with a complete wall. Contrary to expectation, the first cracks in both walls appeared at the same pressure of about 0·09 kg./cm^2. Up to a pressure of 0·13 kg. the outward bending of both walls progressed uniformly, but with further increase in pressure the complete wall was less deflected than the coke-oven wall. It is claimed by Koppers that these tests show how low is the resistance of coke oven walls against lateral pressure. The pressure load in the coke oven, when carbonizing swelling coals, occurs first from the one and then from the other side, and therefore the walls are in constant movement. Thus, in operation, smaller pressures than the measured figure of 0·1 kg./cm.^{2} are sufficient to lead to the distortion of coke oven walls. As the result of these experiments, Koppers has concluded that coals should not be used in coke ovens that set up a pressure greater than 0·08 kg. per sq.cm. in a direction normal to the oven wall.

Koppers and Jenkner then set out to measure the swelling pressures occurring within the charge in the coke oven.

In order to make the desired measurement it was found to be necessary to erect a small carbonizing unit specially for the purpose. This apparatus consisted of a coking chamber heated from both sides and possessing movable heating walls. On the outside of one chamber wall a hydraulic measuring device was installed, which permitted the measuring of the pressure occurring at each moment of the carbonization.

This apparatus recorded swelling pressures generally between 0·1 and 1 atmos., though some coals of poor coking power gave much lower pressures.

In the present forms of laboratory apparatus for examining swelling coals the coal is contained in a crucible or retort made of heat-resisting steel having, for its base, a perforated plate so as to allow of the ready escape of the gases generated at temperatures above the plastic limits. The crucible is heated from below. A plunger is placed upon the top of the coal and is arranged either so that it can move against the applied pressure if the expansive force within the coal is sufficient (Koppers' method), or that registers on a gauge the pressure set up by the coal (Nedelmann's method), the plunger being prevented from moving by an applied force which can be measured.

Bulk Density Allowance.

It is important to know how high the bulk density can be allowed to become if damage is to be avoided. Oven batteries built in coalfields where there is any possibility of the safe limits being exceeded in practice should be provided with a concrete oven chamber at the end of the battery, exactly similar in dimensions to the remainder of the ovens, arranged so that the coal can be charged into it from the machine, and levelled with the beam just as in any of the ovens proper. So far as the Author is aware, the only example in this country is at the Beckton plant of the Gas Light and Coke Company, where Durham coals are generally carbonized. The side wall of this chamber is provided with numerous openings for the extraction of samples of coal at various levels under and between the charging holes, by means of which a given volume of coal can be cut out of the charge, and its density weight can then be ascertained. The highest charging density determined in this way is to be used as a basis for the examination of the coal in the swelling test apparatus.

C. C. Russell, of the American Koppers Company, points out that the conditions under which accepted coal expansion tests are conducted are at variance with practically all comparable conditions in full-scale coke ovens. Translation of the results obtained into practical use must necessarily be made on the basis of experience and of first-hand knowledge of all the factors involved in the causes of coke-oven damage. This Author agrees that the present tests do not reproduce the temporary maximum temperature set up during the coalescence of the two plastic layers in the centre of the oven. He points out that the coke oven is a constant-volume container and believes that it is better to measure the expansive pressure of the coal than to measure its volume expansion under a known pressure; he insists, however, that the conditions should be more comparable to those existing in the coke oven than are obtained in known laboratory methods of testing.

The American Koppers Company has designed a small-scale coke oven in which coal may be carbonized under conditions similar to those in a regular coke oven. One wall of this apparatus is mounted on roller-bearing wheels so that it will move so as to measure the volume change which takes place in the charge under various loads. This oven is substantially the bottom 3 ft. of a regular coke oven. Early in the work it was found that if a 6 in. gas space was left over the charge, part of the lateral expansion was relieved by an upward movement of the coal. In a full-scale oven the bottom 3 ft. of the charge would have approximately 10 ft. of coal

* Fuel, 1932, **11**, 370.
† Glückauf, 1931, **67**, 353.

THE MAINTENANCE OF GAS HOLDERS AND OTHER STEEL STRUCTURES MINIMISED WHEN THEY ARE PROTECTED WITH

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superimposed on it, and while the weight of this column of coal is probably not entirely carried by the bottom portion of the charge, it nevertheless prevents upward movement when expansion takes place. Consequently the lateral expansion is chiefly exerted against the oven walls. A certain low-volatile coal carbonized with a gas space at the top of the charge showed a lateral expansion amounting to 0·1 in. On eliminating the gas space so that there was no room for upward movement, the lateral expansion became 1·75 in.

Conclusion.

It has been the intention of this Paper to indicate the importance in coke oven, and possibly in gas-works, practice of the swelling pressure set up by certain coals. In this country these coals may occur in Kent, Durham, Somerset, and South Wales, though any notable increase in the rate of carbonization or in the bulk density may cause some coals from other districts to become dangerous. It may happen that only one coal out of many that are sent to a carbonizing plant is dangerous, and if that be so the greatest care must be taken to blend this coal properly and to avoid local concentrations of the swelling coal in the oven charges. Balls of sludge, which are sometimes to be found, may be highly destructive. The observation that the swelling pressure of coal increases with increased bulk density of the charge shows how the swelling of the coal can be reduced, or obviated. The remedy consists in loosening the coal charge—*i.e.*, in the reduction of the charging density. This can be effected by finer grinding and, if necessary, by the proper adjustment of the moisture content to give minimum bulk density. It is, of course, necessary to avoid increases in the bulk density such as may be caused, for example, by a sagging levelling rod, or by overcharging the ovens.

If it is necessary to carbonize coals which cause difficulties by swelling, even when at the minimum possible density, the coal must also be blended with inert material such as non-caking coals, durain, or coke dust. Nuts are often richer in durain than the slack and can be added with advantage. Special attention must, however, be devoted to ensuring homogeneous mixtures of the various components, and to avoiding segregation.

A.R.P. Notes

Birkenhead and Wallasey Interlinking Proposals.

The Engineer and Manager of the Birkenhead Gas Department, Mr. J. Hood, reporting to his Committee on the result of an interview between himself and Mr. H. B. Holliday, Engineer and Manager of the Wallasey Gas Department, and officers of the Ministry of Health, of the Board of Trade, and of the Home Office, upon the revised proposals for ensuring continuity of supply of gas to domestic and industrial consumers in time of war, stated that officers of H.M. Government had informed him that they were unable to consider the suggestion that new gas boosting plant should be installed in the existing compressing house, and were only prepared to agree to the alternative scheme of installing the plant in a new building 90 yds. from the existing compressing house at an estimated cost of £3,800.

Clearing Out Craters by Portable Pump.

A portable pumping set for A.R.P. purposes is being put on the market by Messrs. Blackstone & Co., Ltd., of Stamford, Lincs. Its purpose is the handling of liquids containing solids which cannot be dealt with by ordinary water or fire pumps.

The set consists of a Blackstone "unchokeable" pump coupled to a Lister petrol engine. It is mounted on a fabricated steel trailer, which can be manœuvred by one man and, if hitched on to a lorry or motor-car, can be transported at high speed wherever it is needed.

The new pump is economical both to buy and operate. It is intended for such services as decontamination, fire fighting, and for pumping out bomb craters containing debris. Its light-mounting would enable it to be on the scene of trouble within a very few minutes.

The power unit is a four-cylinder Lister air-cooled petrol engine. This type was selected as being particularly suited to continuous running at high loads. The engine is enclosed in a special housing, and cooling is effected by the blower type flywheel fan, which creates a powerful air circulation.

The trailer is fitted with quick release jacks, which enable the plant to stand firm while in operation, and all the other usual accessories, hose, spares, tools, and towing ropes, are accommodated on the trailer. Two sets are to be manufactured—one with an output of 250 gallons per minute to a total head of 60 ft., the other a 4-in. pump with an output of 350 gallons per minute to a 45-ft. head.

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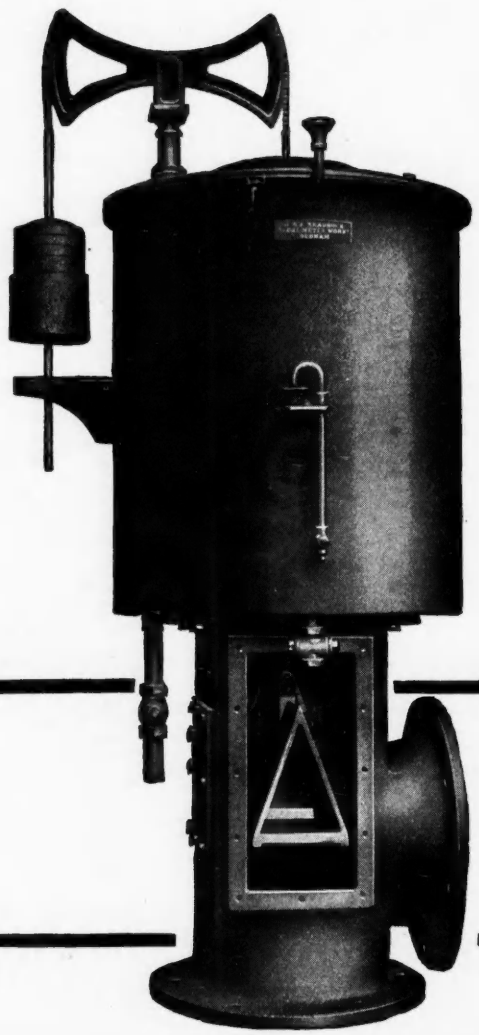

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Markets and Manufactures

Current Sales of Gas Products

The London Market

March 20.

Prices of Tar Products in the London market remain at the following levels:

Pitch, nominal, at about 28s. per ton f.o.b.
Creosote, about 3½d. to 3¾d.
Refined tar, 3¼d.
Pure toluole, about 2s. 3d.
Pure benzole, about 1s. 9d.
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90/160 pyridine, 10s.
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March 20.

Crude Gas-Works Tar, 12s. to 17s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 29s. to 30s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 29s. to 30s.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 2½d. to 1s. 3d. Creosote, *ex* works, in bulk, North, liquid and salty, 3⅞d. to 4⅛d.; low gravity, 4d. to 4¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 10d. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality unsaleable. Heavy oil: Unfiltered anthracene oil, min. gr. 1,080, 4¾d. to 4⅞d; filtered anthracene oil, min. gr. 1,080, 5¼d. to 5¾d.; heavy tar oil, gr. less than 1.080, 4½d. to 4¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW. *March* 18.

Market continues quiet, but makers' prices remain fairly steady.

Crude gas-works tar.—The actual value is round 31s. to 33s. per ton *ex* works in bulk.

Pitch of vertical quality is offered freely at 21s. to 22s. per ton f.o.b. for export and round 20s. per ton *ex* works in bulk for home trade.

Refined tar.—For the home market price is fixed at 3¾d. to 4d. per gallon, while for export supplies can be readily secured at round 2¾d. to 3d. per gallon, both into buyers' packages at makers' works.

Creosote oil is not too active, although producers' ideas are fairly steady as under: Specification oil, 3¼d. to 3¾d. per gallon; low-gravity, 4¼d. to 4½d. per gallon; neutral oil, 3¾d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid is still of little interest, with prices nominal, as under: Pale, 97/99%, 1s. 2d. to 1s. 3d. per gallon; dark, 97/99%, 1s. to 1s. 1d. per gallon; pale, 99/100%, 1s. 4d. to 1s. 7d. per gallon; all *ex* works in buyers' packages.

Crude naphtha is valued at 5½d. to 6d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 3½d. to 1s. 4d. per gallon, and 90/190 heavy naphtha is round 1s. 1d. to 1s. 1½d. per gallon.

Motor benzole is 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—90/160 grade is 8s. 6d. to 9s. 6d. per gallon and 90/140 grade is 9s. 6d. to 10s. 6d. per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole..	0 9½	to	0 10	per gall. at works
Motor „ ..	1 3	„	1 3½	„ „ „
90% „ ..	1 4	„	1 4½	„ „ „
Pure „ ..	1 8	„	1 8½	„ „ „

Contracts Advertised To-Day

Coal.

Buxton Gas Department. [p. 829.]

Resetting Retorts.

Kirkby-in-Ashfield Gas Department. [p. 829.]

Dividend Announcement

Colonial Gas Association.—At a recent meeting of the Directors of the Colonial Gas Association, interim dividends were declared for the half-year ended Dec. 31 last, at the rate of 4%, less income-tax, on the Preference Shares, and at the rate of 3%, less income-tax, on the Ordinary shares.

Exchange will be deducted from these dividends at the rate ruling on the date the dividend was declared—viz., £100 in London for £125 10s. in Melbourne.

The dividends due to shareholders on the London Register will be payable in London on April 4, but where instructions to that effect have already been given to the Association, the dividends due to such shareholders will be paid in Australia to a bank there on their behalf, or to an accredited agent. It is not necessary to renew these instructions, the dividend being paid in accordance with such instructions until further notice is given by such shareholders.

The transfer books of the Company were closed from 2 p.m. on March 15, 1939, and will be opened at 9 a.m. on March 30.

Drysdale & Co., Ltd.

In consequence of the death on Jan. 11 of Mr. James A. Watts, the London Representative of Drysdale & Co., Ltd., his business of James A. Watts & Co. is being wound up, and Messrs. Drysdale have opened an Office in their own name at Royal Mail House, Leadenhall Street, E.C. 3. (Telegraphic Address—Bonaccord Stock London; Telephone No.—Mansion House 3330.)

The Office will be in charge of Mr. Robert M. Wallace, who was with the firm for many years at Yoker, and was thereafter Assistant to the late Mr. Watts for a period of four years. Mr. Wallace will be assisted by a staff fully trained in the firm's work.

PROTECT WITH

METROTECT

a bituminous paint producing a pleasant satin black finish with highly waterproof and anti-corrosive properties.

Protects steel-work which is continuously or periodically immersed in water. Does not become brittle on prolonged atmospheric exposure. METROTECT flows freely under the brush and can be applied quickly and without effort even in cold weather.

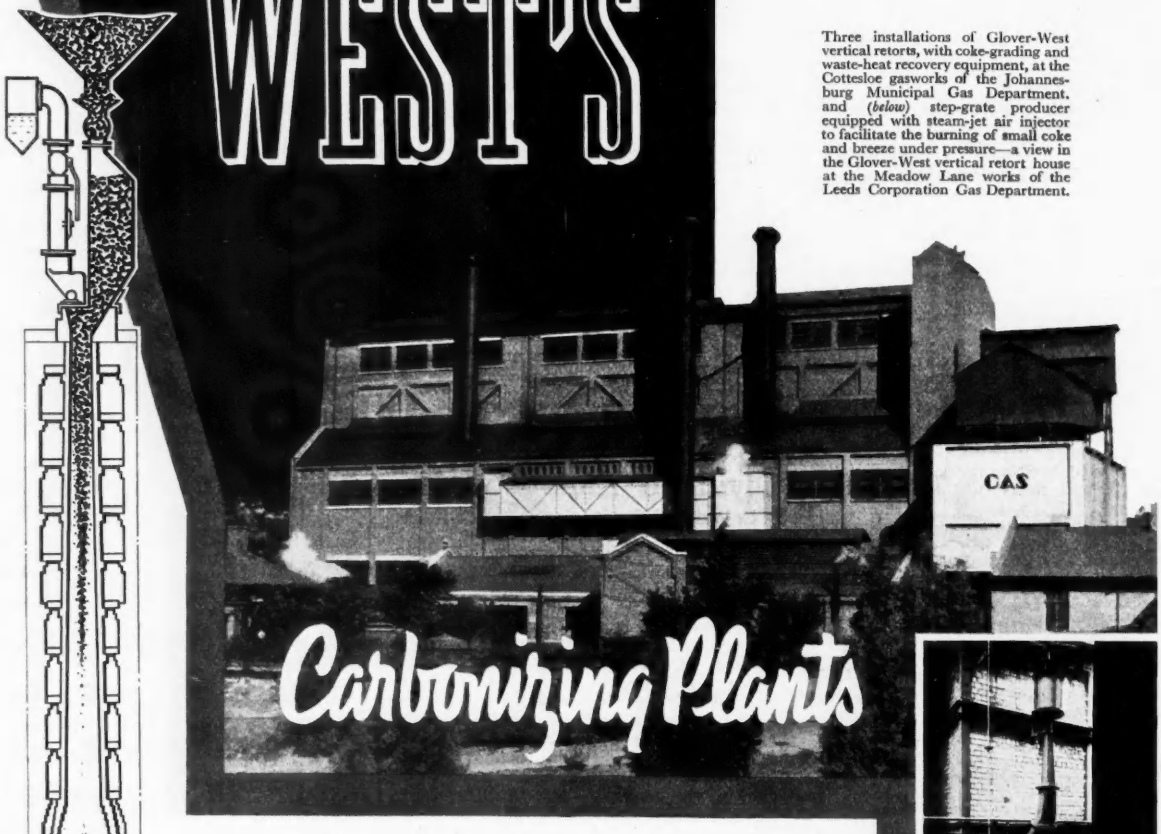
Prices and further particulars from—

SOUTH METROPOLITAN GAS CO.

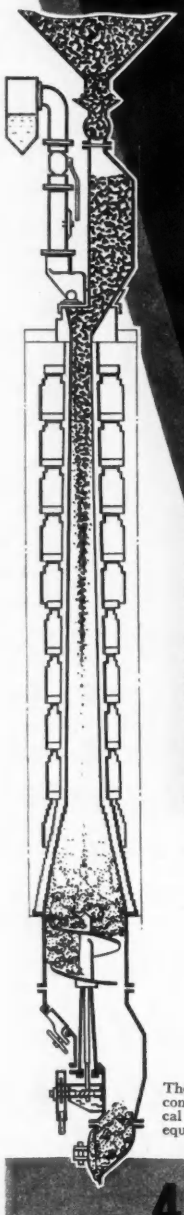
PRODUCTS DEPARTMENT,
REGIS HOUSE,
KING WILLIAM STREET,
E.C.4.

WEST'S

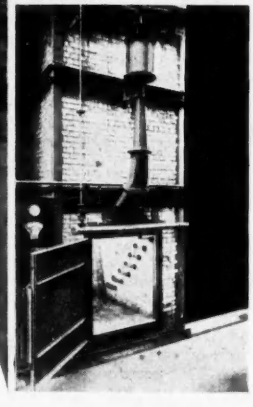
Three installations of Glover-West vertical retorts, with coke-grading and waste-heat recovery equipment, at the Cottesloe gasworks of the Johannesburg Municipal Gas Department, and *(below)* step-grate producer equipped with steam-jet air injector to facilitate the burning of small coke and breeze under pressure—a view in the Glover-West vertical retort house at the Meadow Lane works of the Leeds Corporation Gas Department.



Carbonizing Plants



The Glover-West continuous vertical retort and equipment.



- Increased capacity in relation to ground area covered.
- Output readily adjustable to meet fluctuating demands.
- High yields of gas and coke with low maintenance costs.
- Clean working conditions within the retort house.
- Modern building design and smokeless operation.

WEST'S GAS IMPROVEMENT COMPANY, LTD.
MILES PLATTING, MANCHESTER 10 & COLUMBIA HOUSE, ALDWYCH, W.C.2

Glover-West Vertical Retorts
AND WESTVERTICAL CARBONIZING CHAMBERS

434 PLANTS BUILT OR ORDERED IN 24 COUNTRIES

GAS STOCKS AND SHARES

Events in Europe were responsible for a distinct change in Stock Exchange affairs last week. Whereas quite an appreciable buying movement had begun to make an appearance and gain ground during the previous few weeks, this has now come to an abrupt end, with a consequent serious reaction in values. It is probable that the latest grave situation will once again bring business to a standstill at the opening of the new Account which, to add to the depression, is one of the three-week variety.

Gilt-edged stocks last week weakened a point or so, while home rails lost most of their previous gain, and the same can be said of many leading industrials, as well as oil and mining shares. The political situation had little effect on the Gas market, and with the volume of business about normal prices with few exceptions closed unchanged. Gas Light units were a shade lower at the close, and it will be seen in the list below that the margins of all the Company's fixed-interest stocks narrowed from 5 to 3 points. As could be expected under the circumstances, the major setback in this section on the London Exchange occurred in Imperial Continental, which dropped 6 points to 118½, and is available at the time of writing at 120 to yield £8 6s. 8d.%. In the Provinces, Newcastle units closed fractionally lower at 22s. 9d., while on the Sheffield Exchange Great Grimsby "A" and "B" stocks fell sharply to 185, a loss of 25 points, and the "C" stock dropped 20 points to 180.

The report and accounts of the Alliance and Dublin Consumers' Gas Company for the half-year to Dec. 31 last show that this undertaking continues to make satisfactory progress. Economies during the period resulted in a substantial saving of about £27,000 in expenditure, and, after transferring £5,000 (against £640) to the superannuation fund, the profit on revenue account amounted to £77,847, compared with £50,010 for the corresponding period of 1937. After allowing for interest service the net profit was £69,848, against £43,900. The Directors recommend a dividend of 4% on the consolidated ordinary stock, the rate paid for the past two corresponding periods, which will absorb £70,698, leaving the carry-forward slightly lower at £16,788. The sales of gas show a small increase over those of the corresponding half-year of 1937. The Company's stock is not as a rule readily obtainable, the latest recorded transaction being on March 3 at 137, and at this price the yield works out at £5 16s. 9d.%.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
1,767,439	Mar. 6	8	8	Alliance & Dublin Ord. ...	132—142*	−3
374,000	Dec. 19	4	4	Do. 4 p.c. Deb. ...	93—98	...
734,733	Nov. 7	5	5	Ascd. Gas & Water U'd'ts Ord.	17/—19/—	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/—	...
444,389	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	19/—21/—	...
296,523	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	16/—18/—	...
500,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97*	...
560,070	Feb. 20	7	7	Barnet Ord. 7 p.c.	155—160	...
300,000	Oct. 10	1/9⅔	1/4⅔	Bombay, Ltd.	21/6—23/6	−/6
181,185	Feb. 20	9½	9½	Bournemouth sliding scale ...	192—202	...
690,526	,,	7	7	Do. 7 p.c. max. ...	155—160	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	128—133	...
50,000	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	113—118	...
357,900	Feb. 20	7½	7½	Brighton, &c., 6 p.c. Con. ...	141—146	...
659,955	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	124—129	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	125—130	...
855,000	Sept. 19	8	7	British Ord.	130—135	...
100,000	Dec. 19	7	7	Do. 7 p.c. Pref.	138—143	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	112—117	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
100,000	22 May '33	6	4	Cape Town, Ltd.	1—2	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—2	...
150,000	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	60—70	...
626,860	Feb. 6	6	6	Cardiff Con. Ord.	116—121	...
237,860	Dec. 19	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...
98,936	Sept. 19	2/—	2/—	Colombo Ord.	½—1½	...
24,510	,,	1/4⅘	1/4⅘	Do. 7 p.c. Pref. ...	£2/6—24/6	...
739,453	Oct. 10	−/11·48	−/11·48	Colonial Gas Assn. Ltd. Ord.	16/6—18/6	...
296,144	,,	1/3·30	1/3·30	Do. 8 p.c. Pref. ...	23/6—25/6	...
1,775,005	Jan. 23	5	4	Commercial Ord.	55—65	...
140,000	Feb. 6	§13/4	4	Do. 4 p.c. Red. Pref. ...	95—100	...
620,000	Dec. 5	3	3	Do. 3 p.c. Deb. ...	66—71	...
286,344	Feb. 20	5	5	Do. 5 p.c. Deb. ...	110—115	...
200,000	,,	5⅜	4	Do. 3⅜ p.c. Red. Deb. ...	95—100	...
807,560	Feb. 20	7	7	Croydon sliding scale ...	133—138	...
644,590	,,	5	5	Do. max. div.	98—103	...
620,385	Dec. 19	5	5	Do. 5 p.c. Deb. ...	112—117	...
239,000	Feb. 6	5	5	East Hull Ord. 5 p.c. ...	93—98	...
187,215	Feb. 6	6	6	East Surrey Ord. 5 p.c. ...	113—118	...
176,211	Dec. 5	5	5	Do. 5 p.c. Deb. ...	112—117	...
250,000	Nov. 7	8	4	Gas Consolidation Ord. 'B' ...	19/—21/—	...
250,000	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	17/6—19/6	...
19,189,963	Feb. 6	5⅔	5⅔	Gas Light & Coke Ord. ...	21/—22/—a	−/3
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	73—76	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	95—98	+2
2,993,000	Jan. 9	3½	3½	Do. 3½ p.c. Red. Pref. ...	96—99	+1
8,602,497	Nov. 21	3	3	Do. 3 p.c. Con. Deb. ...	75—78	+1
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—112	+⅛
3,500,000	,,	4⅛	4⅛	Do. 4⅛ p.c. Red. Deb. ...	106—109	+⅛
700,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—97*	+1
270,466	Feb. 20	6	6	Harrogate New Cons. ...	115—120	...
157,500	Mar. 21	1/2⅔	‡1/—	Hong Kong and China Ord. ...	⅞—1	...
213,200	Feb. 6	5⅝	6	Hornsey Con. 3½ p.c. ...	97—102	...
5,600,000	Oct. 24	12	8	Imperial Continental Cap. ...	116—121	−6
172,810	Jan. 23	3½	3½	Do. 3½ p.c. Red. Deb. ...	88—93	...
235,242	Mar. 6	8½	8½	Lea Bridge 5 p.c. Ord. ...	150—160*	−5½
63,480	Dec. 19	3	3	Maidstone 3 p.c. Deb. ...	68—73	...
45,000	Nov. 21	†10	†10	Malta & Mediterranean Metropolitan (of Melbourne)	130—135	...
392,000	Oct. 3	5½	5½	5½ p.c. Red. Deb.	100—105	...
231,977	Feb. 20	5	5	M.S. Utility 'C' Cons. ...	96—101	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	91—96	...
390,076	Dec. 19	4	4	M.S. Utility 4 p.c. Deb. ...	93—98	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	112—117	...
125,000	Jan. ,, 3	3½	3½	Do. 3½ p.c. Red. Bds.	94—97	...
675,000	Nov. 21	†6	†6	Montevideo, Ltd.	70—75	...
250,000	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	140—145*	...
396,160	Feb. 6	5	5	Northampton 5 p.c. max. ...	105—110	...
300,000	Oct. 24	†7	†9	Oriental, Ltd.	145—150	...
468,537	Dec. 5	8	7½	Plymouth & Stonehouse 5 p.c.	130—140	...
621,667	Feb. 20	8¼	8¼	Portsmouth & Gosport Cons.	154—159	...
241,446	,,	5	5	Do. 5 p.c. max. ...	98—103	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	105—110	...
75,000	,,	4	4	Do. 4 p.c. Pref. ...	88—93	...
114,000	Feb. 6	5	5	Preston 5 p.c. Pref.	105—110	...
247,966	Dec. 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	96—101	...
625,959	Jan. 9	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
15,000	Mar. 6	6	6	San Paulo 6 p.c. Cum. Pref. ...	8—9*	...
441,275	Sept. 19	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	20/6—22/6	...
460,810	Sept. 19	−/10½	−/10½	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...
133,201	Mar. 6	8½	5	Shrewsbury 5 p.c. Ord. ...	141—146*	...
9,000	June 3	4	‡4	South African Ord.	4½—5½	...
1,371,752	Aug. 22	1/2⅔	1/2⅔	South East'n Gas Cn. Ld. Ord.	21/6—23/6	...
871,636	Mar. 6	−/10½	−/10½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/—*	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	17/—19/—*	...
450,000	Feb. 6	4	4	Do. 4 p.c. Deb.	96—101	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
6,709,895	Feb. 6	5	6	South Met. Ord.	97—100	−½
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	125—130	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	92—97	...
1,895,445	Dec. 19	3	3	Do. 3 p.c. Deb.	72—77	...
1,000,000	Jan. 9	5	5	Do. 5 p.c. Red. Deb. ...	107—110	...
600,000	,,	§31/—	3⅜	Do. 3⅜ p.c. Red. Deb. ...	98—101	...
1,543,795	Jan. 23	6	6	South Suburban Ord. 5 p.c. ...	109—114	...
512,825	,,	5	5	Do. 5 p.c. Pref.	105—110	...
500,000	,,	4	4	Do. 4 p.c. Pref.	92—97	...
250,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	91—96	...
888,587	Dec. 5	5	5	Do. 5 p.c. Deb.	111—116	...
250,000	,,	4	4	Do. 4 p.c. Deb.	93—98	...
200,000	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
427,859	Sept. 19	8¼	9⅜	S. Western Gas & Water Ord.	16/—18/—	...
160,523	Oct. 10	−/10½	−/10½	Do. 4½ p.c. Red. Cum. Pf.	19/—21/—	...
110,000	Dec. 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100	+2
750,541	Feb. 6	5	5½	Southampton Ord. 5 p.c. ...	104—109	...
148,836	Dec. 19	4	4	Do. 4 p.c. Deb.	93—98	...
350,000	Feb. 6	5½	5½	Swansea 5½ p.c. Red. Pref. ...	105—110	...
200,000	Dec. 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
1,076,490	Feb. 20	6⅔	6⅔	Tottenham and District Ord.	122—127	−1
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	114—119	...
62,235	,,	5	5	Do. 5 p.c. Pref.	105—110	...
453,380	Dec. 5	4	4	Do. 4 p.c. Deb.	93—98	...
85,701	Jan. 9	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
1,131,550	Aug. 22	6	4	U. Kingdom Gas Cor. Ord. ...	18/—19/—	...
1,051,280	Nov. 7	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	19/—21/—	...
762,241	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	19/—21/—	...
745,263	Dec. 19	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	15/6—47/6	...
1,066,186	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—99*	...
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c.	123—128*	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	103—108*	...
1,371,138	Jan. 23	7	7	Wandsworth Consolidated ...	122—127	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	90—95	...
1,343,964	Dec. 19	5	5	Do. 5 p.c. Deb.	111—116	...
383,745	,,	4	4	Do. 4 p.c. Deb.	93—98	...
400,000	,,	§25/—	3⅜	Do. 3⅜ p.c. Red. Deb. ...	96—101	...
558,342	Feb. 6	6⅔	6⅔	Watford and St. Albans Ord.	127—132	...
200,000	,,	5	5	Do. 5 p.c. Pref.	105—110	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref.	112—117	...
200,000	,,	§16/8	4	Do. 4 p.c. Red. Pref. ...	95—100	...
200,000	Dec. 19	4	4	Do. 4 p.c. Red. Deb. ...	93—98	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...

a.—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations March 17.	Rise or Fall on Week.
202,152	Sept. 5	5	5	Ascot Ord.	101—106	...
128,182	Dec. 19	5	5	Do. 5 p.c. Pref.	104—109	—3
31,035	Aug. 22	—/4½	—/4½	Associated Utilities 4 p.c. Pref.	16/—18/—	...
100,000	Dec. 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
17,000	Feb. 20	8	8	Bognor Orig. Ord. 'A' ...	152—162	...
62,210	,,	8	8	Do. New Addl. 'A' ...	152—162	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	142—152	...
37,440	Feb. 6	10	10	Cam. Univ. & Town 10 p.c. max.	183—193	...
125,970	,,	7	7	Do. 7 p.c. max.	131—136	...
39,025	,,	5	5	Do. 5 p.c. max.	95—100	...
96,410	Feb. 6	4⅛	4⅛	Cardiff 4⅛ p.c. Pref. ...	93—98	...
150,000	Feb. 20	4	4	Croydon 4 p.c. Pref.	91—96	...
130 000	Dec. 19	4	4	Do. 4 p.c. Deb.	93—98	...
65,000	Mar. 6	7⅛	7⅛	Eastbourne 'A' 5 p.c. ...	128—133*	—2
198,000	,,	6	6⅜	Do. 'B' 3½ p.c.	111—116*	...
112,312	,,	5	5	Do. 5 p.c. Pref.	105—110*	...
130,000	Dec. 19	5	5	Do. 5 p.c. Deb.	110—115	...
24,000	Feb. 20	8½	8½	Great Yarmouth 8½ p.c. max.	30—35	—
59,400	,,	7½	7½	Do 7½ p.c. max.	27—32	—
51,160	Dec. 5	5⅛	5⅛	Do. 5⅛ p.c. Deb.	117—122	...
152,600	Feb. 20	8	9	Guildford Cons.	160—165	...
54,055	,,	5	5	Do. 5 p.c. Pref.	103—108	...
68,250	Dec. 19	5	5	Do. 5 p.c. Deb.	109—114	...
156,600	Feb. 20	7¼	7¼	Hampton Court Cons. ...	120—125	—3
80,000	Mar. 6	4	4	Lea Bridge 4 p.c. Pref. ...	90—95*	...
60,000	,,	6	6	Do. 6 p.c. Pref.	120—125*	...
94,876	Dec. 5	4	4	Do. 4 p.c. Deb.	92—97	...
73,620	Mar. 6	8¼	8¼	Luton Cons. 'A'	150—160*	...
107,960	Sept. 19	5¼	4	Mid Kent Ord.	8¼—9¼	...
230,940	Feb. 6	10	10	Oxford & District Ord. ...	192—197	...
47,112	,,	5	5	Do. 5 p.c. Pref.	104—109	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	108—113	...
126,193	Nov. 7	7½	7½	Peterborough Ord.	137—142	...
64,990	Mar. 6	7½	7½	Redditch Ord....	115—125*	...
166,850	Feb. 6	8	8	Romford Ord....	142—147	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—102	...
44,000	Sept. 19	5	5	Do. 5 p.c. Deb.	110—115	...
25,570	Feb. 6	5½	5½	Rugby 5½ p.c. Pref.	118—123	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	103—108	...
42,750	Dec. 5	5½	5½	Do. 5½ p.c. Deb.	117—122	...
110,950	Feb. 20	8	8	Ryde Ord.	137—147	...
270,086	Sept. 5	7	7	Slough Ord.	128—133	...
21,000	Dec. 19	5	5	Do. 5 p.c. Deb.	107—112	...
28,872	Nov. 7	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	17/—19/—	...
28,866	Mar. 6	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/—19/—*	...
117,228	Feb. 20	5	7	Swindon Cons.	100—105	...
60,425	Dec. 5	5	5	Do. 5 p.c. Deb.	108—113	...
64,380	Dec. 19	5	5	Torquay & Paignton 5 p.c. Pref.	105—110	...
130,000	Feb. 6	5	8	Wakefield Ord.	116—121	...
81,650	,,	5	5	Do. 5 p.c. max.	92—97	...
82,000	Jan. 23	6	6	Weymouth Ord.	101—106	...
98,384	Feb. 6	6	6	Wolverhampton 6 p.c. Pref.	117—122	...
160,000	Dec. 19	5½	5½	Do. 5½ p.c. Rd. Db.	103—108	...
90,000	Dec. 19	5	5	York 5 p.c. Red. Deb. ...	102—107	...
133,640	Feb. 20	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	115—120	...
120,000	,,	5	5	Do. 5 p.c. Pref.	103—108	...
35,000	Dec. 5	5½	5½	Do. 5½ p.c. Deb.	115—120	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
347,756	Feb. 6	5	6	Bath Cons.	115—117	...
1,667,250	Feb. 6	5	5	Bristol, 5 p.c. max.	109½—111½	...
120,420	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	98—101	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	98—101	...
328,790	,,	5	5	Do. 5 p.c. Deb.	115—118	...
274,000	Feb. 20	5	5	Newport (Mon.) 5 p.c. max. ...	95—97	—½
13,200	Sept. 19	8⅔	7	Pontyp'l Gas & W. 10 p.c. 'A'	12½—13½	...
13,600	,,	6	5	Do. 7 p.c. 'B' ...	11½—12½	...
40,000	,,	6	5	Do. 7 p.c. 'C' ...	11½—12½	...
140,778	Feb. 6	5	5	Weston-super-Mare Cons. ...	103½—105½	...
64,338	Dec. 19	4	4	Do. 4 p.c. Deb. ...	98—101	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb. ...	149—152	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
157,150	Feb. 6	5	6½	Chester 5 p.c. Ord.	107—110	...
92,500	Dec. 19	4	4	Do. 4 p.c. Pref.	95—99	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	87—90	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—101	...
2,167,410	Feb. 20	6	6	Liverpool 5 p.c. Ord.... ...	120—122	...
245,500	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	100—105	...
306,083	Jan. 23	4	4	Do. 4 p.c. Deb.... ...	100—102	...
106,280	Feb. 6	10	10	Preston 'A' 10 p.c.	177—187	...
188,219	,,	7	7	Do. 'B' 7 p.c.	129—139	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
122,577	Feb. 20	8	8	Blyth 5 p.c. Ord.	157½—158½	...
732,000	Feb. 20	3	3	Hartlepool G. & W. Cn. & New	67⅞—68½	...
2,061,315	Feb. 6	5	5⅛	Newcastle & Gateshead Con.	22/6-23/-a	—/-1½
682,856	,,	4	4	Do. 4 p.c. Pref. ...	98½—99½	...
776,706	Dec. 19	3½	3½	Do. 3½ p.c. Deb. ...	88—89	...
277,285	Oct. 24	5	5	Do. 5 p.c. Deb. '43 ...	103½—105½	...
332,351	Feb. 6	6	6	Sunderland 6 p.c. max. ...	132½—134½	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
542,270	Feb. 6	6	9	Derby Con.	132—137	...
55,000	Dec. 19	4	4	Do. 4 p.c. Deb.	100—105	...
20,000	Dec. 19	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations March 17.	Rise or Fall on Week.
10,000	Feb. 6	10	10	Great Grimsby 'A' Ord. ...	180—190	—25
6,500	,,	10	10	Do. 'B' Ord. ...	180—190	—25
79,000	,,	10	10	Do. 'C' Ord. ...	175—185	—20
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	135½—137½	...
95,000	Dec. 19	4	4	Do. 4 p.c. Deb.	100—102	...

a The quotation is per £1 of Stock.
* Ex div.

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